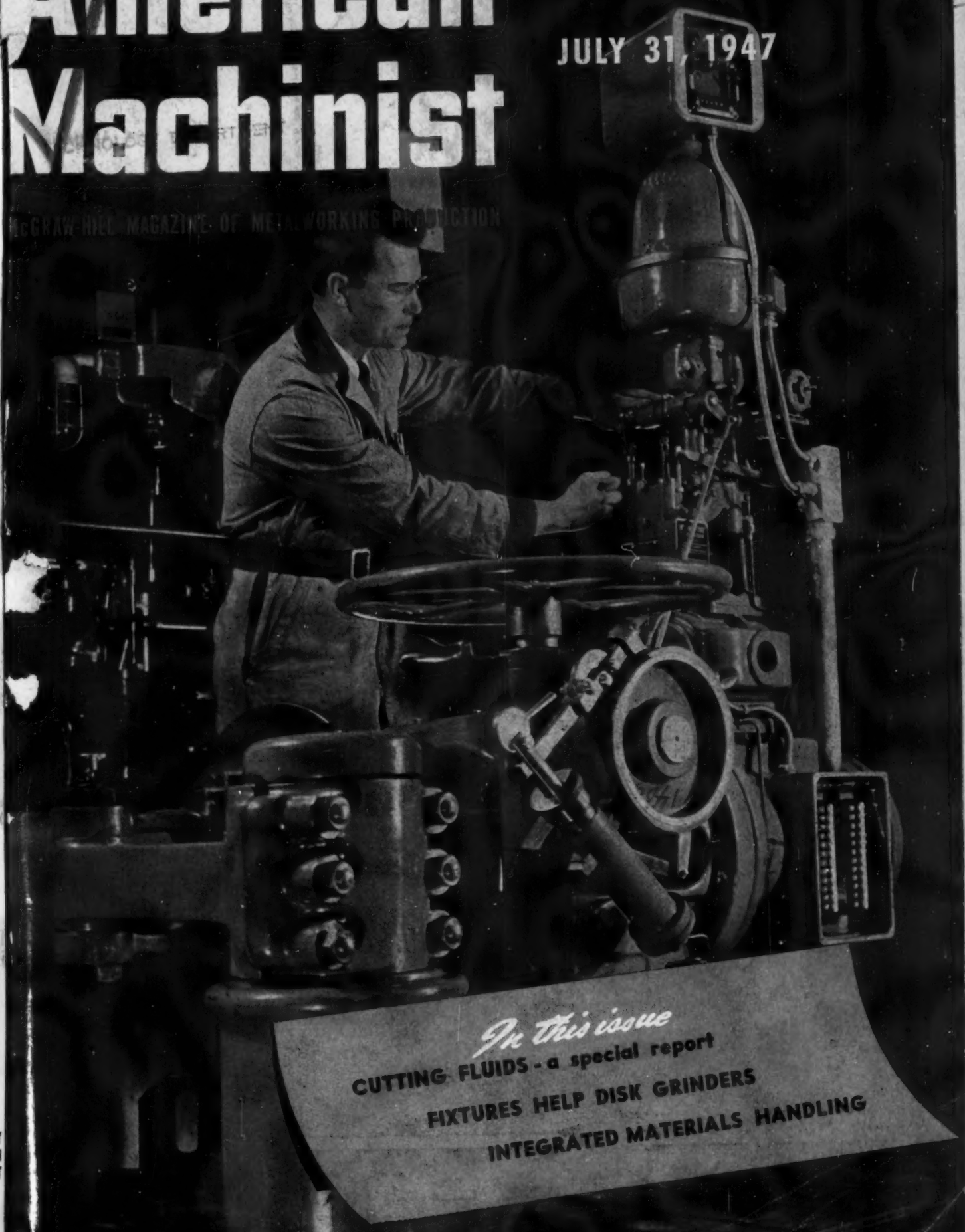
American Machinist

JULY 31, 1947

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



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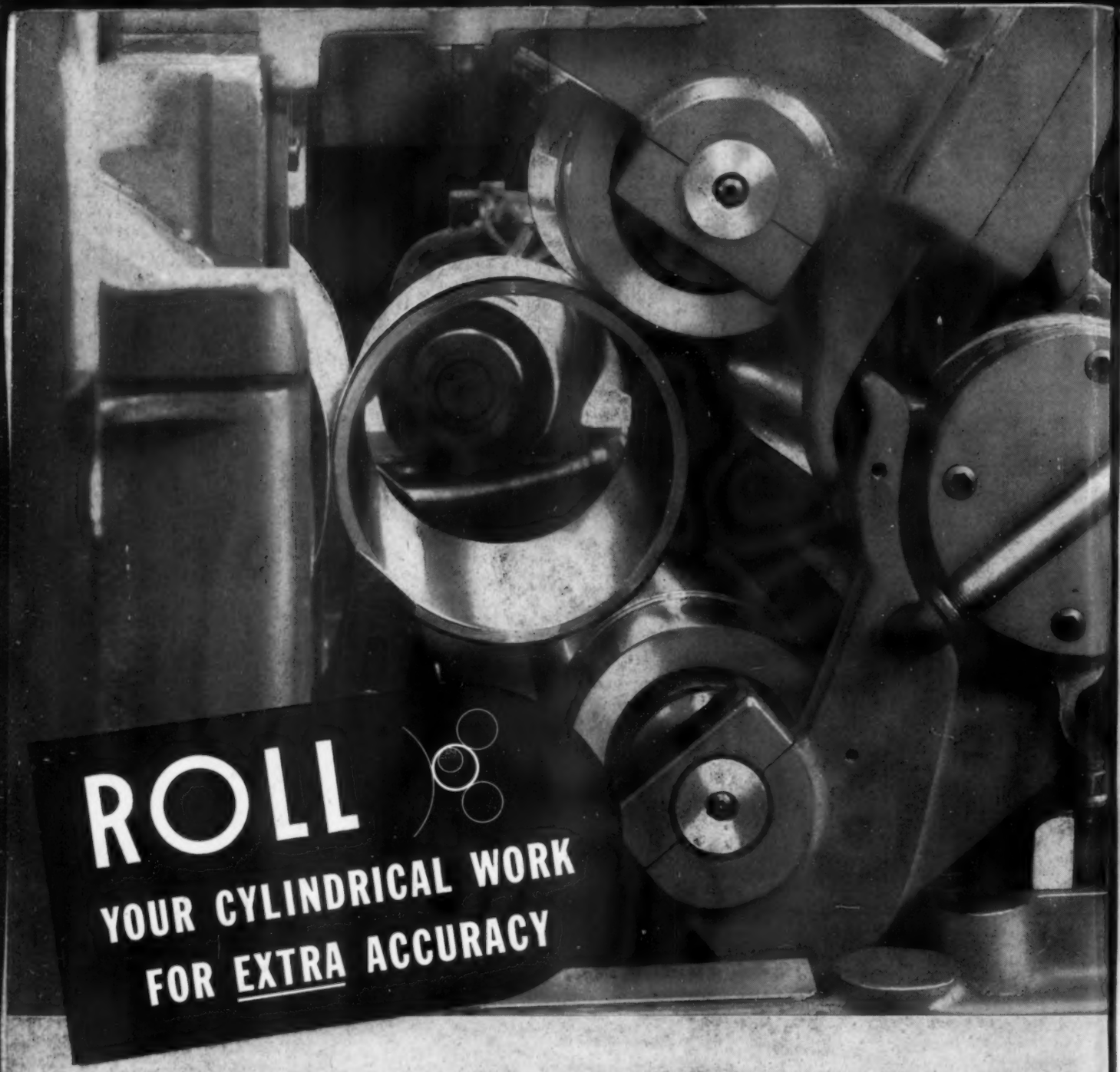
FIXTURES HELP DISK GRINDERS

INTEGRATED MATERIALS HANDLING



. . . on a Heald Centerless Internal—the chuckless grinding machine!

HERE'S HOW you get improved accuracy on a Heald Centerless Internal. The part to be ground—a cylinder sleeve, for example—is placed between three rolls. A regulating roll drives the work, aided by a support roll and pressure roll. As a result, chucks are eliminated, since these rolls locate and rotate the part on its own outside diameter.

It's simple to operate—yet this Heald Centerless method of grinding improves quality of work and saves set-up time . . . it assures perfect concentricity between ground bore and O.D. . . . permits relocation without error for re-chucking or reversal . . . produces unusual accuracy on thin wall sections . . . and often enables one operator to handle several machines.

Little wonder that Heald Centerless Internals are used so extensively in the grinding of rings, sleeves, bearing races, bushings, valve parts, and other cylindrical work. If you'd like to know more about the Heald Centerless method of internal grinding—how it can be applied in your own work—we'll be glad to send you our latest bulletin on the subject. THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision . . . less cost

INTERNAL AND SURFACE GRINDING MACHINES — BORE-MATIC PRECISION FINISHING MACHINES

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Member of the Associated Business Papers and the Audit Bureau of Circulations.

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

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PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y.
Cables: "McGRAW-HILL, New York"

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Chips and QUIPS

Governor Inspection . . . Our cover Kodachrome, taken by Hans Zielke, shows Louis Fenne doing final assembly on a Type HR waterwheel governor at Woodward Governor Co. The governor is a 16,300-ft. lb. unit (size 10x9½ in.), and Mr. Fenne confesses he likes to make Kodachromes too.

Cutting Handbooks . . . Our "normal" special report in this issue is a condensed handbook on cutting fluids which Associate Editor Flynn has been assembling these many months. In it are combined the latest recommendations from producers, large users and machine-tool builders . . . Then for our pre-Show report we have the first half of our forecast of new machining developments to be shown, based on questions we've asked dozens of builders (who insist that some things we daren't talk about until Sept. 11—our Show issue).

Tooling Data . . . Gordon Murphy, plant superintendent for Eversharp, describes a 14-station progressive die for lead-feed clutches in mechanical pencils. They're formed from brass strip in a die incorporating feed and air injection . . . Also for tool engineers, as well as mold designers, is G. M. Bleakley's description of the method of approximating true dished surfaces to speed mold drawings. The method he describes is used in designing refrigerator-door tooling in the Micarta Div. of Westinghouse . . . Then there's our regular diet of Practical Ideas, and an idea from Federico Strasser of Santiago, Chile. Mr. Strasser had a pierced hole so close to the blank edge that the work didn't strip properly, causing punch breakage. He applied an auxiliary stripper —no more trouble.

Grinding . . . Rapid finishing on single- and double-spindle disk grinders is largely dependent on sound fixturing. Fred Schaub, chief engineer of Hanchett Mfg. Co., describes some typical ones in this issue . . . We also have John Nylen, president of Nylen Products, describing his centerless grinding and lapping line for replacement automotive piston pins. They come off at 1700 to 2500 per hour . . . There's a story on transfer molding, too.

Materials Handling . . . From the new Erie plant of G. E. comes a story by Floyd E. Bliven, supervisor of salvage. He explains how standardization simplified and expedited materials handling . . . Two other articles help this one become fact-crammed — one on mechanizing forging presses, the other part III of Mr. West's series on electric-furnace brazing, this one dealing with selection and operation of the furnace itself.

Welcome Guest . . . John T. Harbison, director of purchases, Hawk-Eye Works, Eastman Kodak, said this recently: "As a rule, sales managers do not get out into the field. Some have never been in the field, and the vice presidents do not pack the wallop that the title suggests. *We want to work with the chap that knows his product from beginning to end, what it has done for others and what it will do for us. We are glad to take this type of fellow into our confidence because we know that he will understand our problems and will make constructive suggestions.* No need for him to make an appointment in advance—he is a welcome guest."

Coming . . . Caterpillar Tractor, as the largest employer in Peoria, has realized its community responsibilities and assumed them. The man who watches community relations will tell you about it in *A.M.* for Aug. 14 . . . Then there'll be a description of typical progressive induction-hardening setups, applications of the formula for sliding of involute gears . . . There'll be, as well, a story about applications of bench shapers, another on visual layout—a generally well-rounded diet.

BRAZING SPECIALIST . . . C. L. West, vice president of The Electric Furnace Co., wrote the three articles concluding in this issue and dealing with practical aspects of joining components of metal assemblies by furnace brazing.

Mr. West has been with Electric Furnace for more than 17 years, during which he has contributed largely to the design and development of controlled-atmosphere furnaces in general. Prior to that time, he spent about 15 years in design and manufacture of tools, dies, special machinery, drop forgings and stampings.

See the GLEASON Exhibit

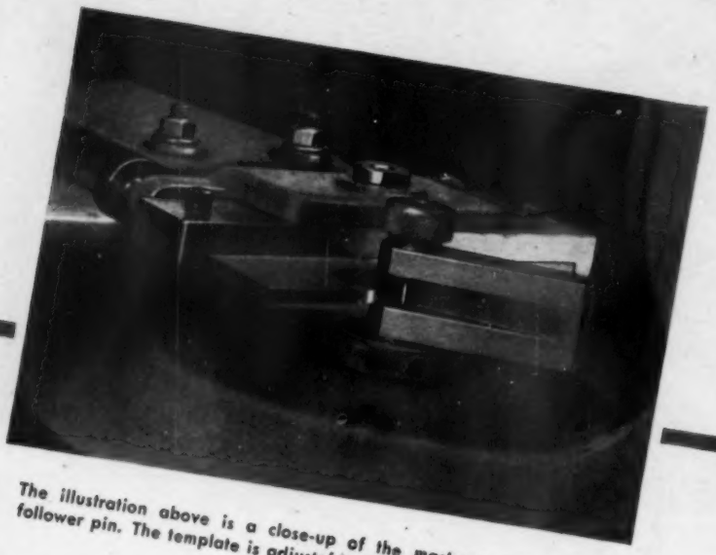
"Contact the designers, engineers, company executives . . . no one can afford to miss this show. Here, for the first time in a decade, every modern development known to the machine tool world will be on display. Here, too, will be the latest Gleason bevel gear equipment designed for greater productivity, greater accuracy and finer quality . . . Gleason's way of insuring more goods for more people at lower cost."

SEPTEMBER MT 17 to 26

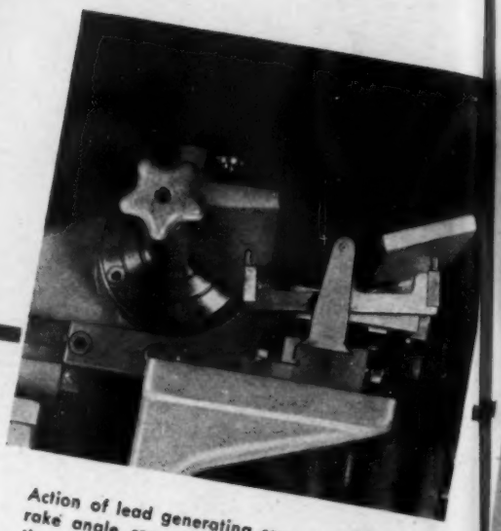
GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

BOOTH 330

Builders of Bevel Gear Machinery for Over Eighty Years



The illustration above is a close-up of the master template and follower pin. The template is adjustably mounted to facilitate setup.



Action of lead generating cam at left and rake angle compensator at right (illustration above) are synchronized by means of the pivoted rocker arm.

For sharpening formed milling cutters... THE NEW CINCINNATI CONTOUR CUTTER SHARPENING MACHINE

Are you familiar with the many advantages offered by profile type milling cutters over conventional form relieved (cam relieved) cutters? To mention only three of them:

More parts per grind. Longer cutter life. In most cases higher feed rates.

And where profile type form milling cutters have been adopted as a standard, the way to sharpen them is on the new CINCINNATI Contour Cutter Sharpening Machine. This machine has several noteworthy features. For example:

Wheelhead "floats" on completely anti-friction slide mounting. Effortless one-hand movement of the wheelhead in any direction makes it easy to follow the master template.

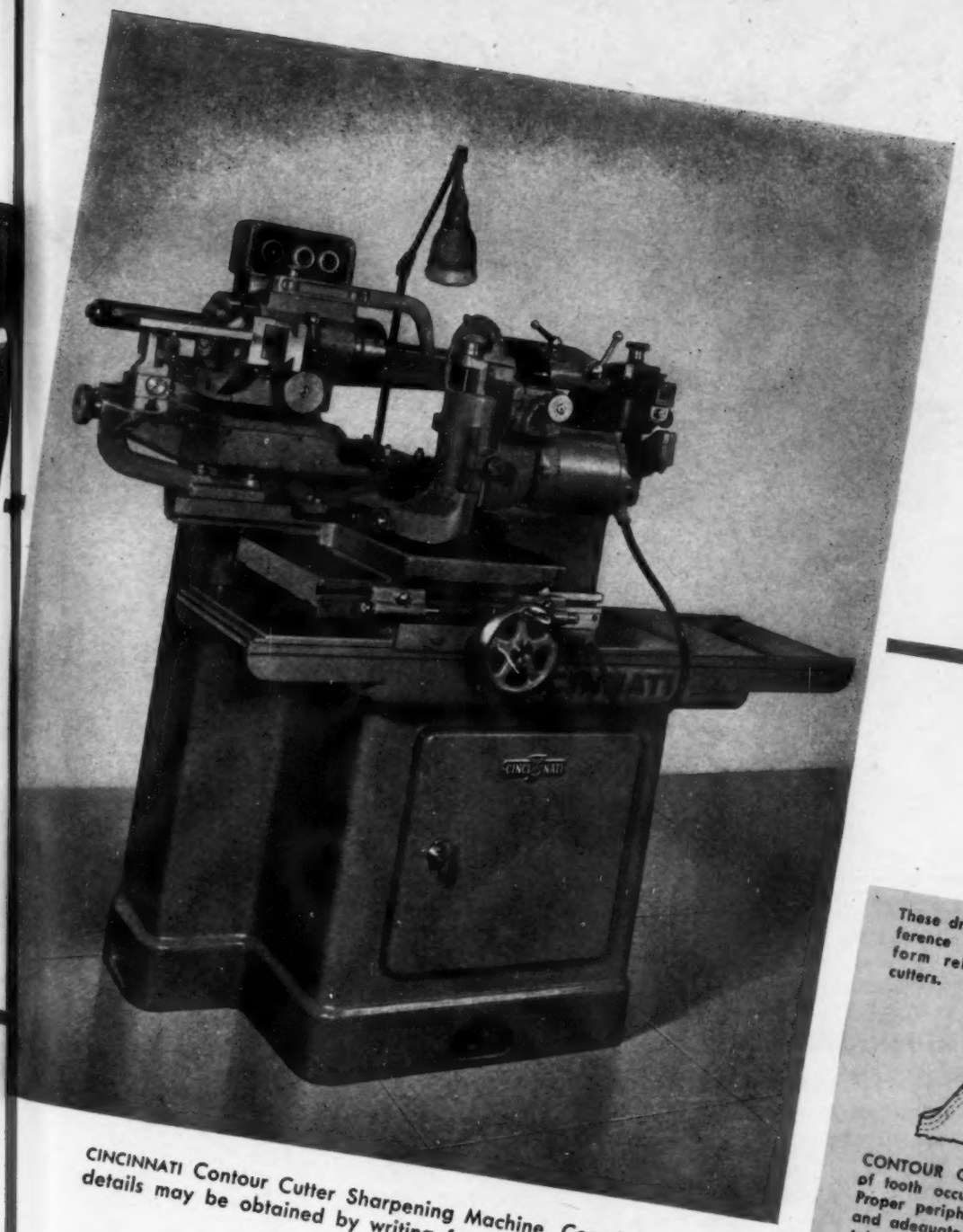
Wheelhead swings freely on smooth, anti-friction swivel mounting. Permits the grinding wheel to maintain correct angular relationship with various degrees of angularity of cutter profile.

Simplified lead generating device with cams for leads of 30", 40", 50", 60", 80" and infinity (straight). Cutter can be produced with the helix angle which gives the most effective cutting action.

Details on all features and their benefits, as well as complete specifications on the new CINCINNATI Contour Cutter Sharpening Machine, may be obtained by writing for catalog M-1552.

THE CINCINNATI MILLING

MILLING MACHINES

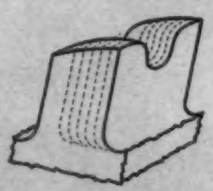


CINCINNATI Contour Cutter Sharpening Machine. Complete details may be obtained by writing for catalog M-1552.

CINCINNATI

These drawings illustrate the basic difference in tooth structure between form relieved and profile ground cutters.

CONTOUR GROUND—Desired profile of tooth occurs at cutting edge only. Proper peripheral and side clearance and adequate chip space easily maintained.



CAM RELIEVED — Desired profile must be carried back into tooth. Impossible to use adequate clearance angles, especially side clearance.

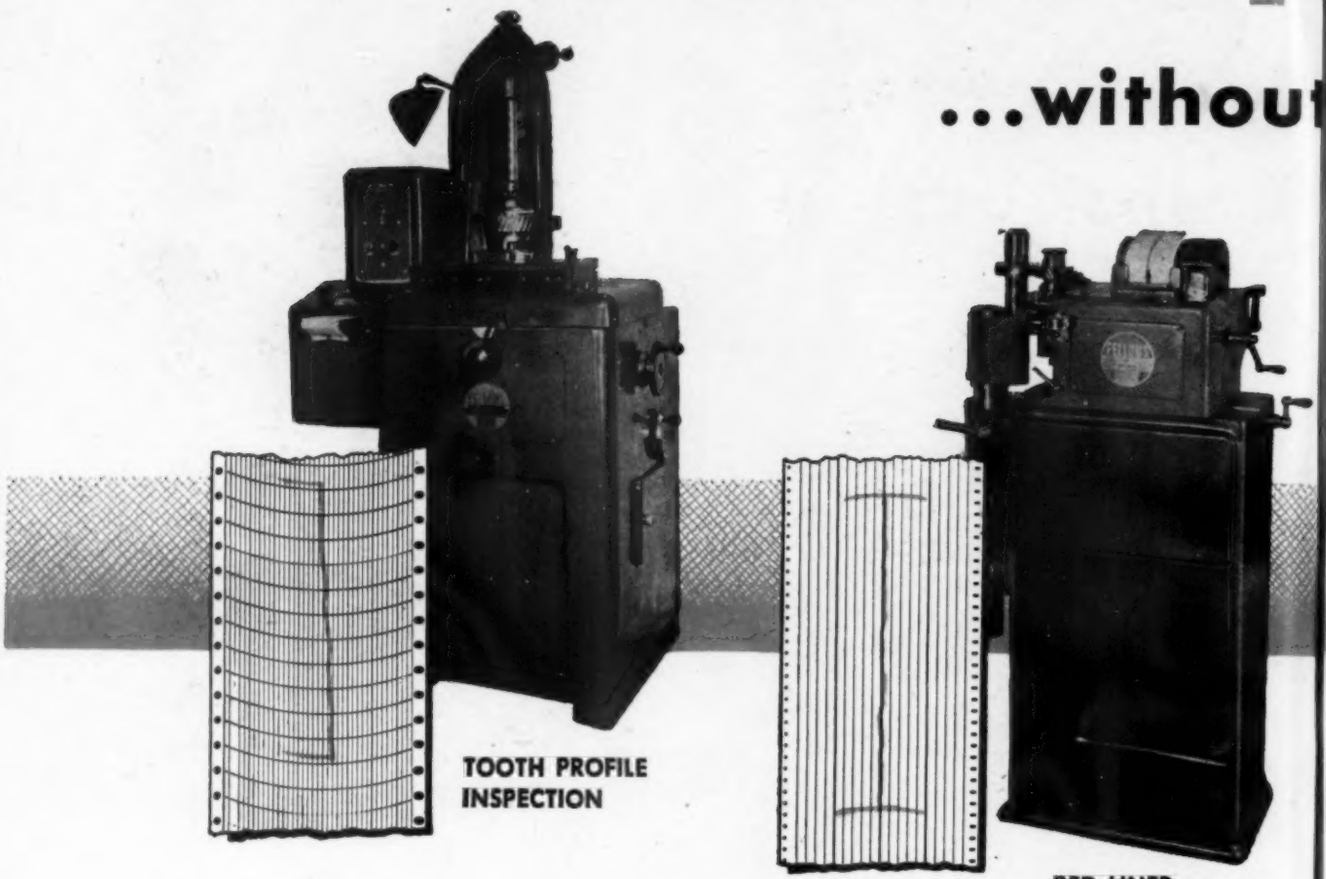
See the CINCINNATI MILLING DISPLAY at the MACHINE TOOL SHOW, Booth No. 306 Chicago, Sept. 17-26

MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Gear Accuracy...

...without C



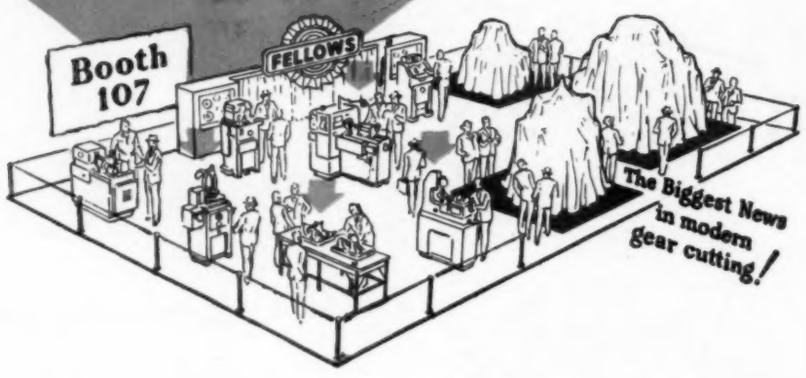
TOOTH PROFILE INSPECTION

RED LINER INSPECTION

Coordinated Instrument Inspection
...Keystone of Production Control

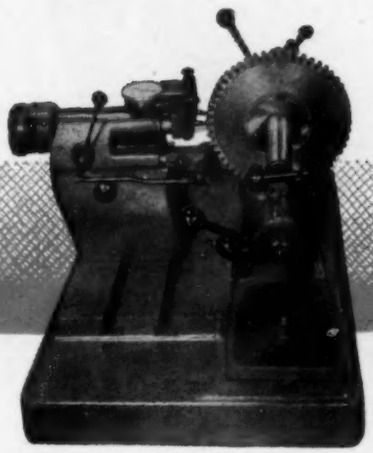
See these machines

AT THE
MACHINE TOOL SHOW
CHICAGO
SEPT. 17 to 26

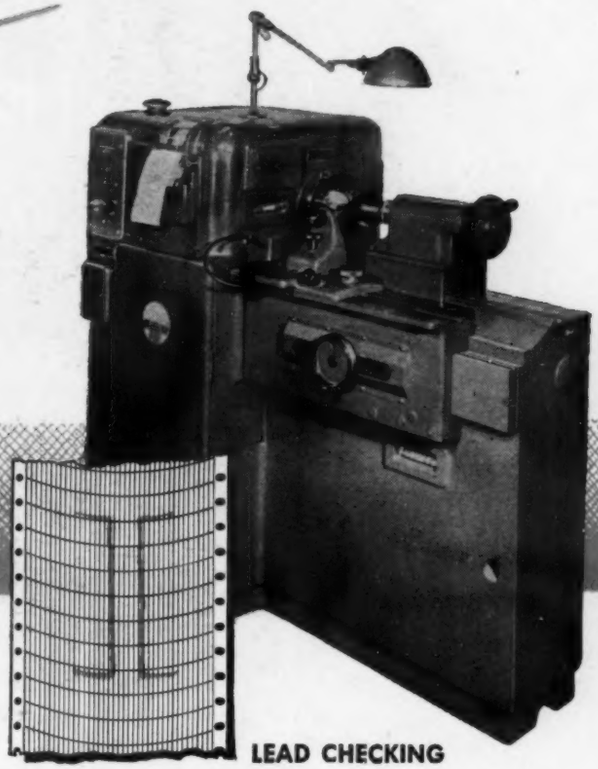


...a "Will-o-the-Wisp"

ut Coordinated Inspection



GEAR TOOTH SPACING AND CHECKING



LEAD CHECKING

Fellows Gear Inspection Instruments present the highest development in equipment for control over gear accuracy, both for individual tooth elements, and final over-all inspection. All Fellows Measuring Instruments operate on basic principles, and consequently set a standard for accuracy that cannot be duplicated. You ought to know all about each and every one of these instruments... let us send you up-to-the-minute literature on any one, or all of these modern inspection instruments. Write: The Fellows Gear Shaper Company, Head Office and Export Department: Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2... or 640 West Town Office Bldg., Chicago 12.

Fellows

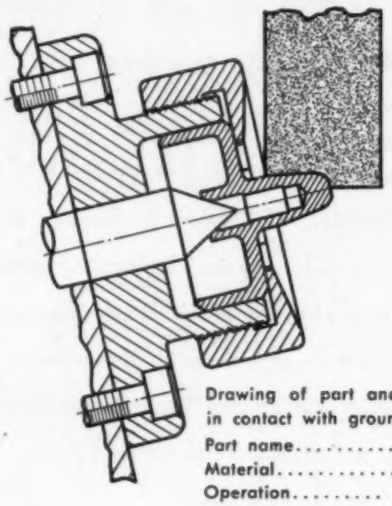
THE FELLOWS METHOD...MACHINES AND TOOLS FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

For those small hard-to-grind jobs

CINCINNATI FILMATIC 4" PLAIN HYDRAULIC

TAILORED TO FIT

Machines which can be readily tailored to facilitate difficult grinding operations offer two principal advantages: 1) maximum production, 2) minimum investment. An example of this type of equipment is illustrated on the opposite page. ¶Starting with a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, Cincinnati Application Engineers removed the standard swivel table, headstock and footstock, and replaced them with an upper table having a 12½° angular section for the headstock, a live spindle headstock with a special chucking device, a profile truing attachment operated from a cam attached to the machine bed, and a latch device, positive stop, and dial indicator for the table. The FILMATIC bearing wheelhead was retained. ¶With the aid of an automatic infeed unit, the machine form grinds the stem diameter of stainless steel valves in one chucking of the work. ¶This is another example of Cincinnati Application Engineering in low-cost precision grinding. Their many years' experience is at your disposal. A letter from you, with a blueprint of the part stating complete requirements, will enable these engineers to help you do a better grinding job at lower unit cost, and with minimum operator fatigue.



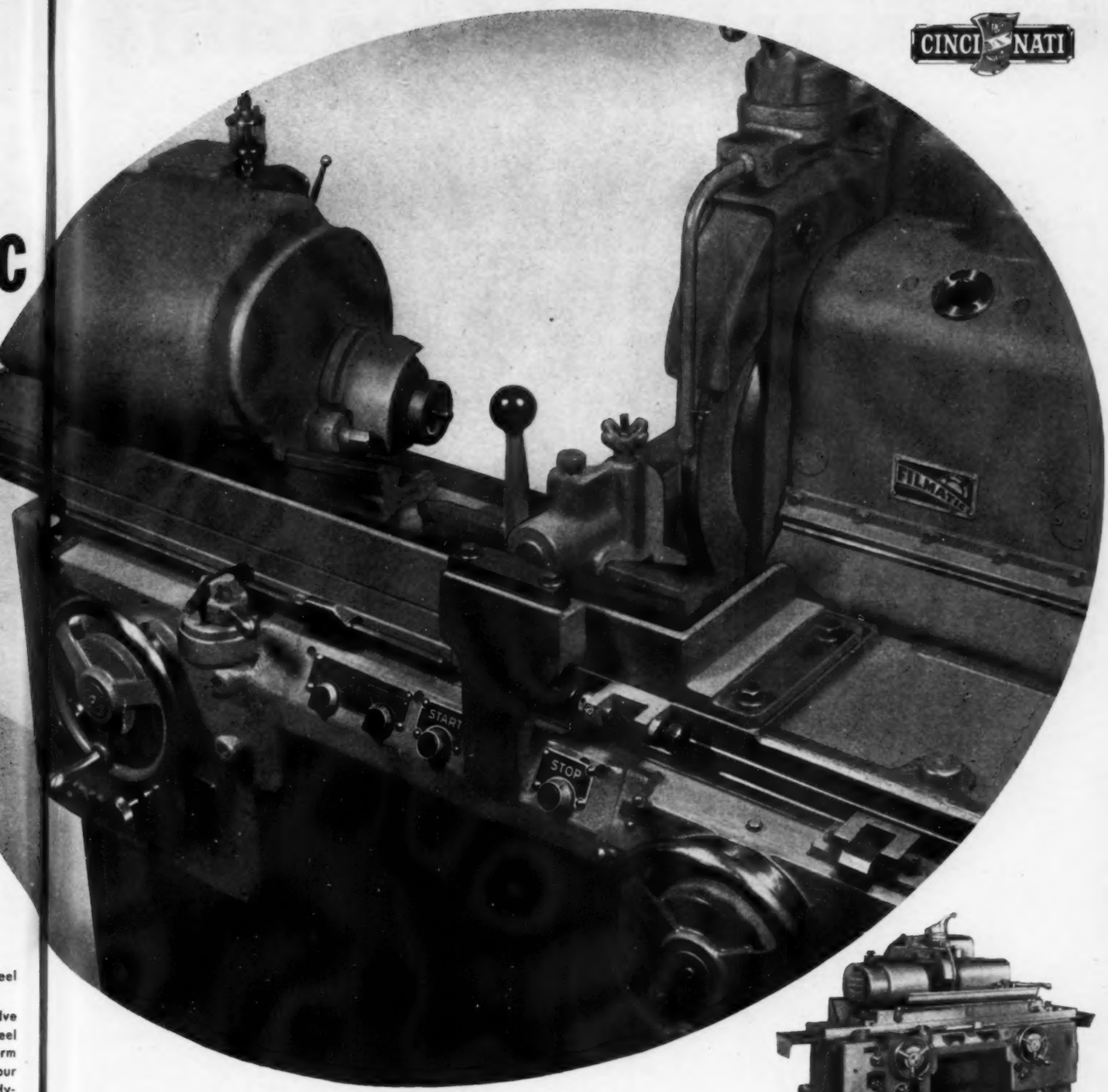
Drawing of part and chuck, showing wheel in contact with ground surface.

Part name..... Valve
Material.....Stainless Steel
Operation..... .....Grind form
Production..... .....38 per hour
Machine—CINCINNATI FILMATIC 4" Plain Hydraulic Grinder with special equipment tailored for the job.

See the CINCINNATI GRINDERS DISPLAY at the MACHINE TOOL SHOW, Booth No. 306 Chicago, Sept. 17-26

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES



Close-up of special equipment applied to a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, to form grind the stem diameter of stainless steel valves by the infeed method.

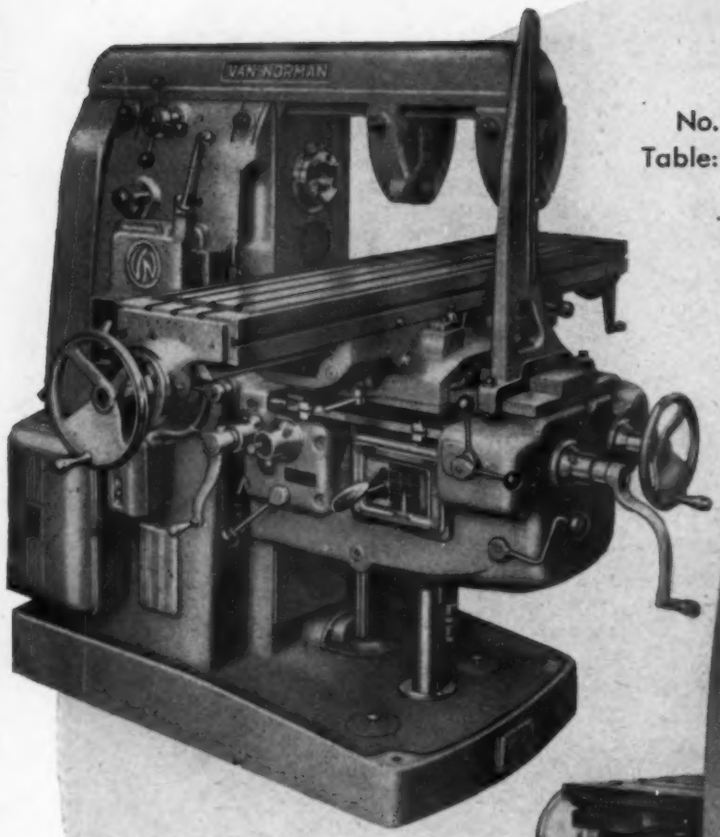
CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are built in 4" x 12", and 4" x 18" sizes. Complete specifications may be obtained by writing for catalog G-551.

INCORPORATED

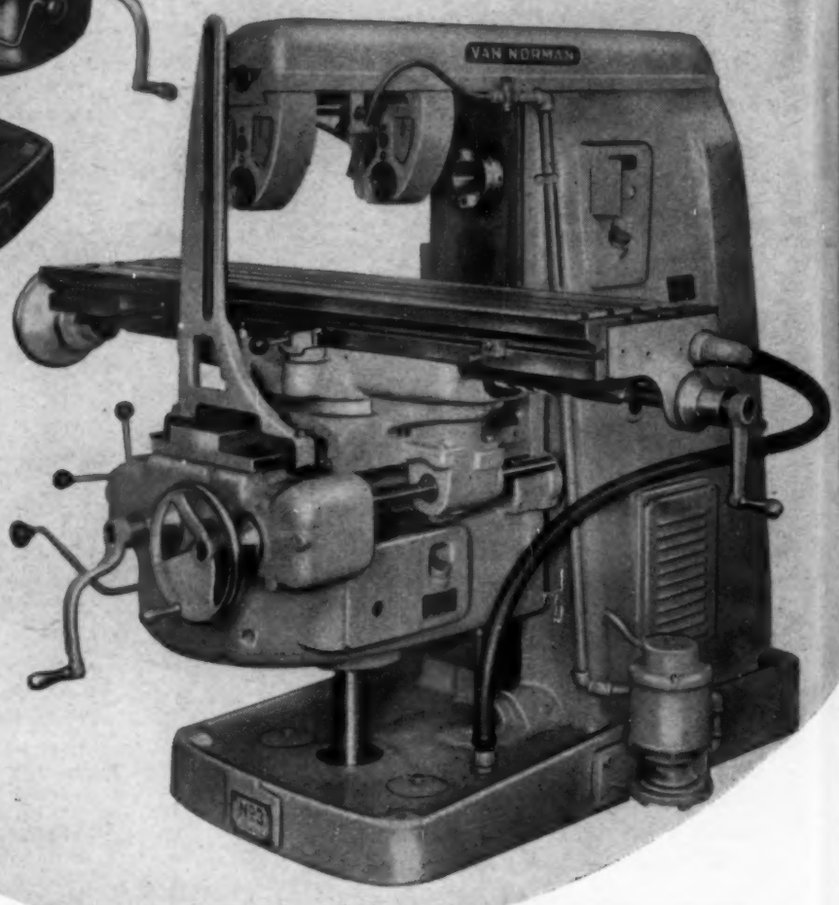
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

For Improved Cutability



No. 2 Heavy
Table: 58 x 13 in.



No. 3 Standard
Table: 64 x 14 in.

"It pays to Van Normanize"

That Increases Production

IT'S

VAN NORMAN

Horizontal Milling Machines

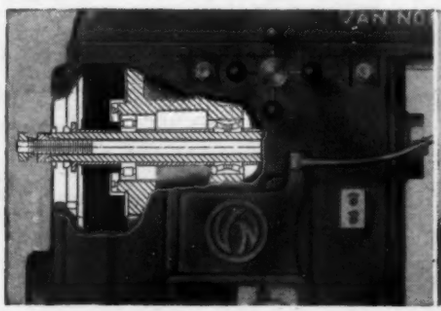
The new Van Norman Horizontal Milling Machines No. 2 Heavy and No. 3 Standard feature a heavy built-in spindle flywheel that provides smooth uninterrupted transmission of power to the cutter. This outstanding design advantage increases cutability and improves quality of finish of work produced on these machines.

The new heavy-duty spindle is supported by five anti-friction bearings assuring maximum spindle rigidity under the heaviest of cuts.

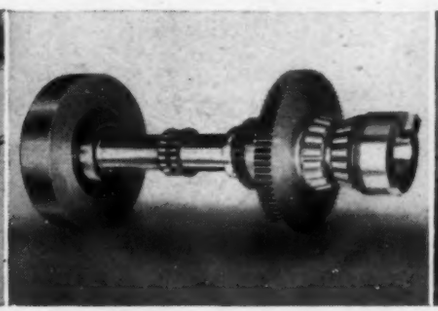
Other Van Norman advantages include . . .

Front and rear hand, power, and rapid traverse controls, single lever feed and speed selectors, overarm pilot wheel, large easy-to-read dials, automatic lubrication, hardened alloy steel gears with large tooth area and heavy rugged column and base.

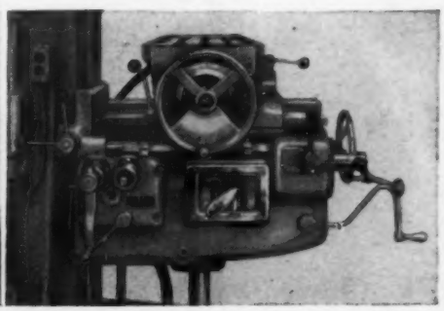
The Van Norman No. 2 Heavy and No. 3 Standard are available with plain or universal saddles. Write for information, today.



BUILT-IN SPINDLE FLYWHEEL, mounted on spindle inside the column, assures uniform uninterrupted transmission of power to cutter. The heavy flywheel increases and improves cutability . . . permits smoother finish of work surface.



5 ANTI-FRICTION BEARINGS support the large diameter alloy steel spindle. They maintain accuracy by assuring maximum spindle strength and rigidity under every type of cut.



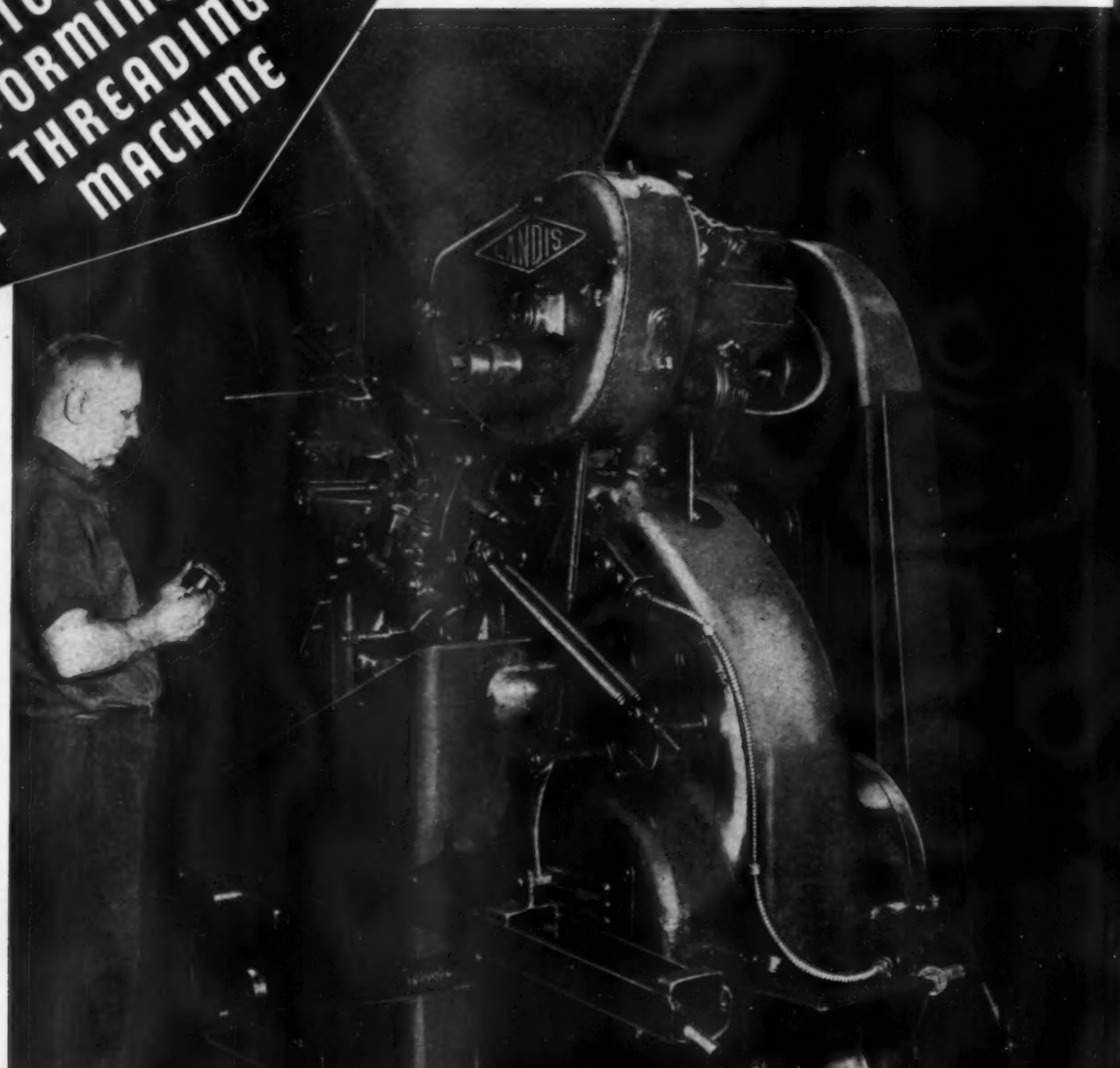
FRONT AND REAR CONTROL of fingertip power and six-way rapid traverse levers and manual adjustments simplifies operation. Directional power controls provide maximum work and operator safety.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

High Speed
964 3/4" BOLTS

LANDIS AUTOMATIC FORMING & THREADING MACHINE



1947 MACHINE TOOL SHOW CHICAGO

LANDIS MACHINE CO.

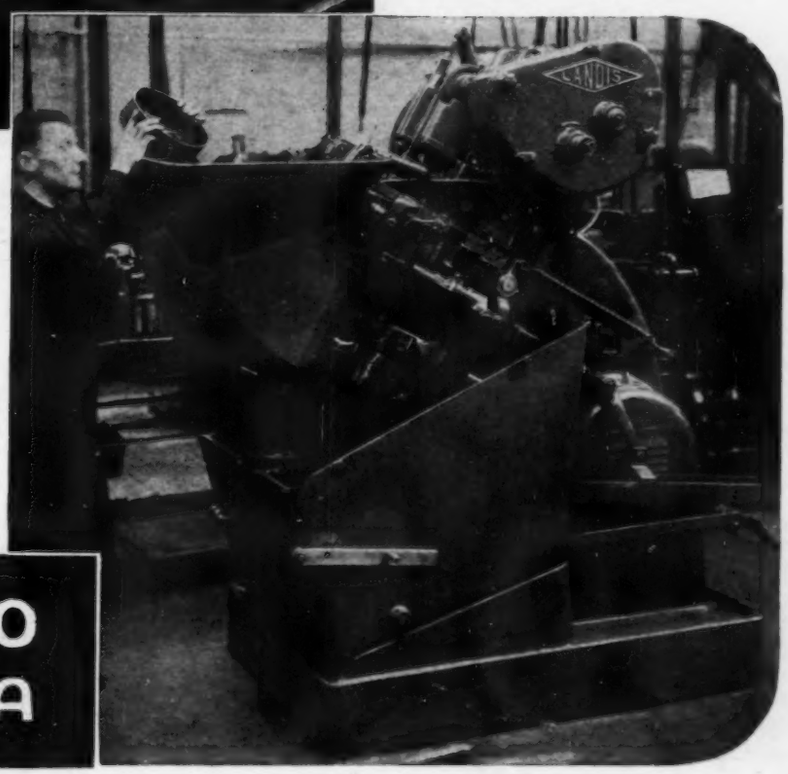
PRODUCTION
PER HOUR, POINTED AND THREADED

• The LANDIS Automatic Forming and Threading Machine is a fully-automatic machine designed to thread and point bolts, studs, cap screws, etc., from cold headed or hot forge blanks. The machine is built with semi-vertical spindles, thus saving space, and one man can easily operate a battery of eight machines.

Bolt blanks are dumped continuously into the hopper. The operation is then automatic until the finished bolts are ejected into an oscillating conveyor carrying them to a container.

Short set-up time is ideal for short runs—a change in thread length in 5 minutes, in bolt length in 10 minutes, in speed in 2 minutes—a complete change in diameter, pitch, thread length, and bolt length in 40 minutes.

Write for Bulletin E-70



MORE BOLTS PER HOUR, PER MAN

• Output varies from 750 to 1800 bolts per hour with the length and diameter of the thread. The Landis Automatic Forming and Threading Machine is illustrated producing:—on the left, pointed and threaded 3/4" machine bolts 4" long with a 10 pitch, Class 2 fit, 1" long thread at the rate of 964 bolts an hour in the plant of one of the nation's largest bolt manufacturers—in the center close-up, over 1,000 7/16" alloy steel cap screws per hour with 20 pitch, Class 3 fit threads—on the right, bolts, 5/8"-11 pitch with 1 1/2" thread length at 786 per hour, and over 10,000 threads per chaser grind.

WAYNESBORO
PENNA · U·S·A

hydraulic cam contour grinder

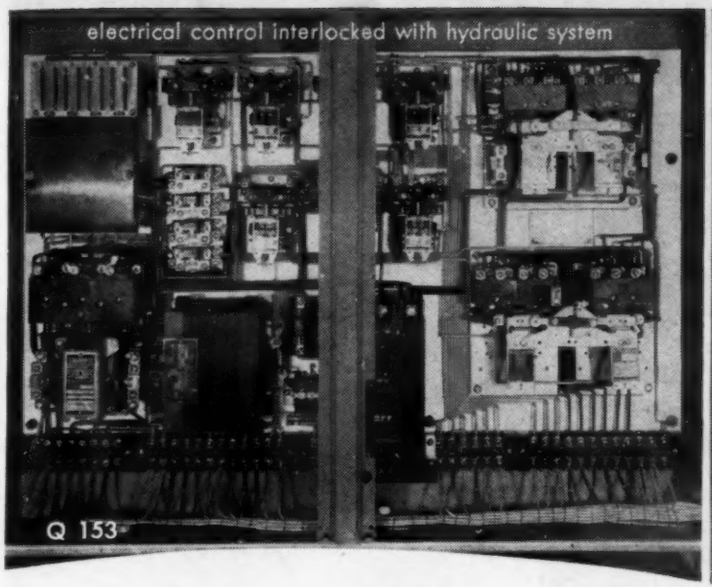
OPERATION 80% AUTOMATIC

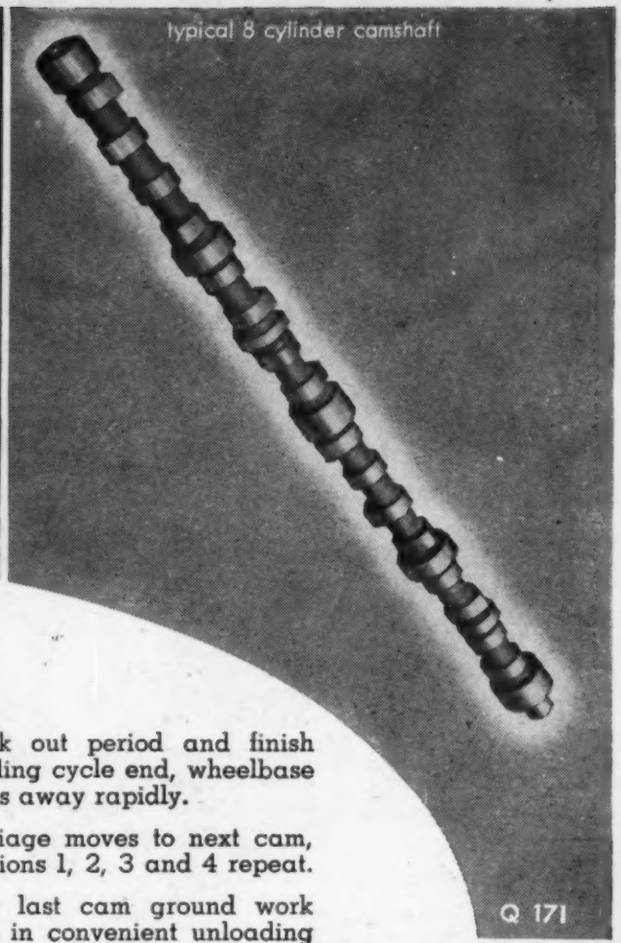
gives high production — close tolerances

EQUIPPED WITH MICROSPHERE BEARINGS

5" DH Hydraulic Cam Contour Grinder—Catalog Q-46

LANDIS TOOL
Precision Grinders





grinding cycle operation 80% automatic

manual operation

1. Operator loads machine.
2. Operator moves control lever to start position.

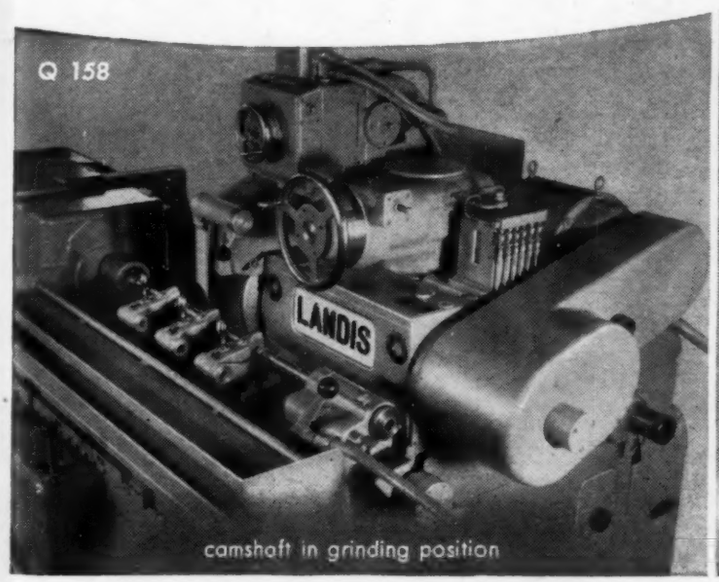
automatic cycle

1. Carriage moves to grinding position on first cam.
2. Work rotation increases to rough grinding speed, wheelbase feeds in rapidly, wheel spindle reciprocation and grinding feed start.
3. Rough grinding ends, work rotation slows to finish grinding speed.
4. Spark out period and finish grinding cycle end, wheelbase backs away rapidly.
5. Carriage moves to next cam, functions 1, 2, 3 and 4 repeat.
6. After last cam ground work stops in convenient unloading position.

manual operation

3. Operator unloads and reloads machine. While removing finished camshaft and reloading, grinding wheel is dressed automatically.

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.



'Sure it's big work for a 20-inch lathe but she does a swell job..."

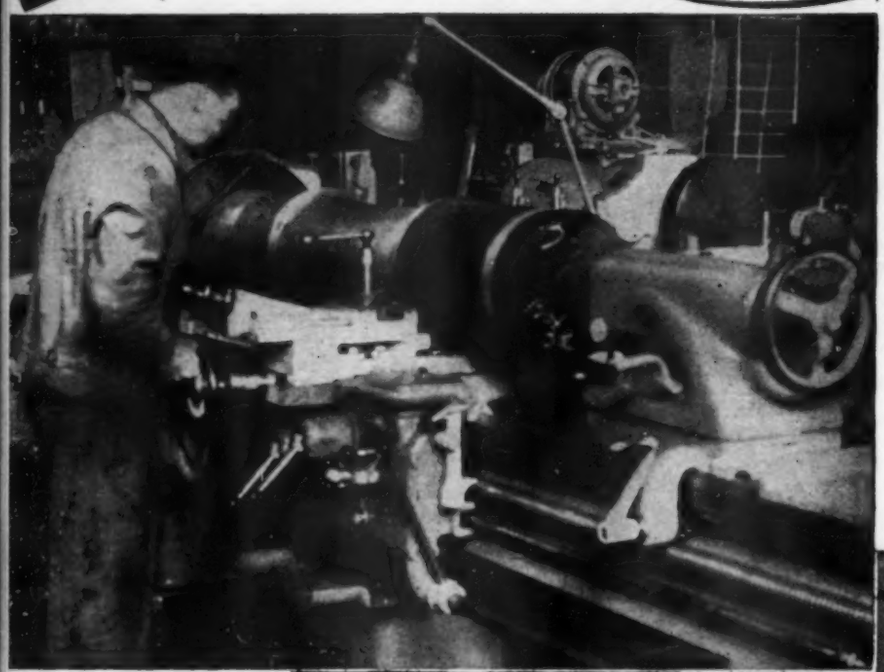
In these few words th superintendent of prominent railroad sho expressed approval of h "AMERICAN" Pace maker Lathe.

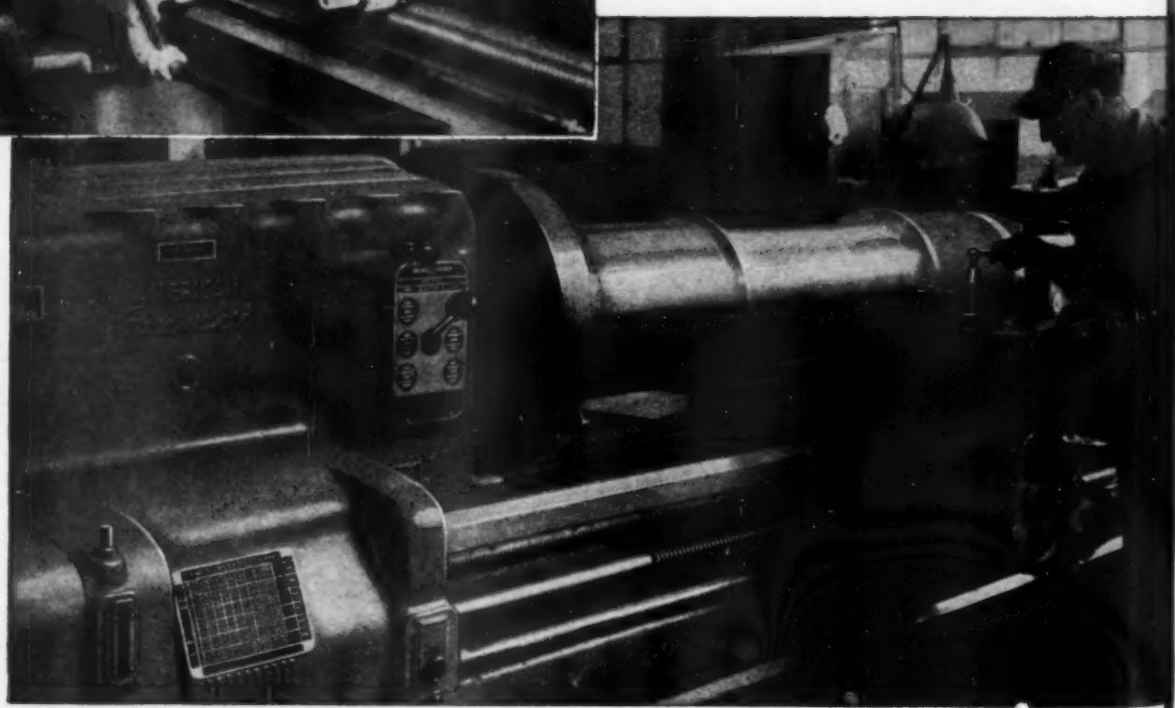
He particularly likes-

1. The power and speeds f using cemented carbide too to their limit.

2. The ruggedness and stamin which permit large work t be done without chatter.

3. The ease and convenience o control which saves operatin time and encourages operato to use correct speeds an feeds.





"American" Pacemaker Lathes are favorites in many of our best railroad shops. They are dependable, low-cost producers. Send for descriptive bulletin No. 16.

"American" Hole Wizard Radial Drills are also doing a fine job for the railroads.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Quick-change Artist

There are many design and construction features that make the Bryant No. 112 precision internal grinder a *"Quick Change Artist"*—make it easy to set up or change over to suit a wide range of jobs.

Quickly adjusted cycle controls for wheelslide—Selection of cycle phases either manually or automatically through main wheelslide control. Independent setting of wheelslide traverse for wheel dressing and grinding by two convenient hand throttles. Universal stop rod positions wheelslide for face grinding. Positive locking reversing dogs for setting grinding stroke quickly. Belt driven wheelheads; Hi-Frequency wheelheads for speeds up to 100,000 R. P. M.

Work spindle designed for operating efficiency—Rigid setting for taper grinding up to 90° included angle, provided by double circular slide mounting. Infinite spindle speeds from 100 to 1000 R.P.M. Quick interchange of chucks, holding fixtures and face plates provided by American Standard Type Cam Lock Spindle Nose.

Three cross feed controls for versatility—Fast set-up provided by rapid traverse cross feed. Increased output on long runs with power cross feed control. Accurate size control through precision feed dial.

These are the highlights that make set-up of the 112 simple and change-over fast. When combined with the basic features available in all Bryant grinders, they add up to less down time, more accurate work, finer work finish and faster production. If you are interested in a *"Quick Change Artist"*, write today for the No. 112 catalog.

Another BRYANT Postwar Development

Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT

MORSE
Spring Tempered Shank has high tensile strength to absorb torsional stress and shock.
Super High Speed Steel Head is butt-welded on shank, for greatest cutting action.
Note Expansion Feature which allows compensation for wear—giving long life to cutting head. Hollow head adjusting screw is countersunk to permit grinding upon centers.
No. 1734
TAPER SHANK
No. 1733
STRAIGHT SHANK

Like Tabby...

MORSE *Expanding Chucking* REAMERS

have more than One Life

...and Longer Life per grind when reground

You're looking at a reamer that can really take on a volume of work! Due to its *expansion* feature, it can be reground and reground each time it's worn slightly below size. The cutting head is Super High Speed Steel —butt-welded onto a spring tempered shank. Result: An expanding chucking reamer designed for rugged duty, long life and maximum cutting efficiency.

Morse makes a full line of reamers that will do every reaming job to your tolerances. Over 80 years of Morse engineering know-how pays off, too, in drills, cutters, taps, dies and special tools that step up volume and lower your costs. Your Industrial Supply Distributor can obtain the Morse recommendation that fits the tool to *your* job.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

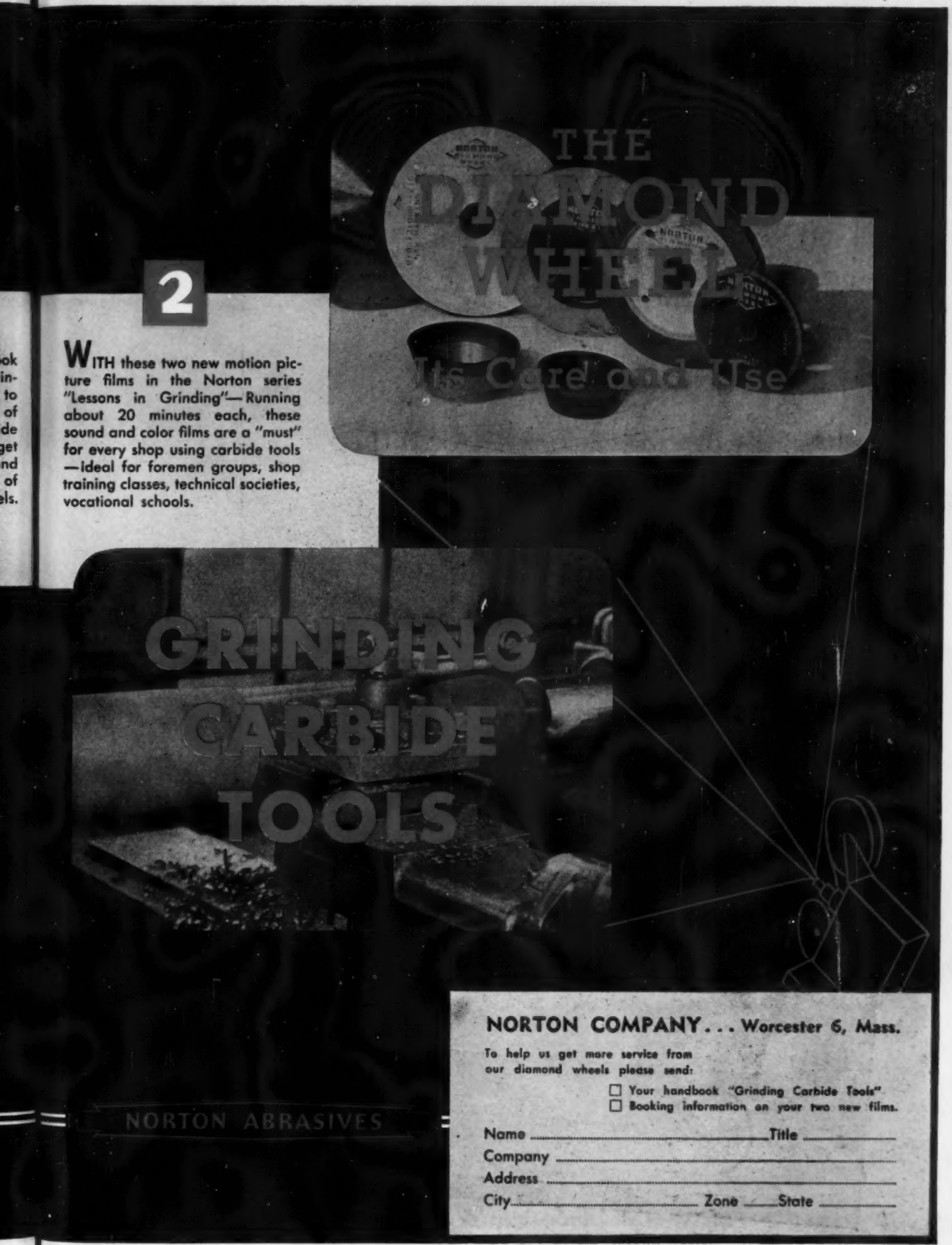
NEW BEDFORD, MASSACHUSETTS

York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

Here's How Norton Can Help You to Get GREATEST EFFICIENCY from Your Diamond Wheels!

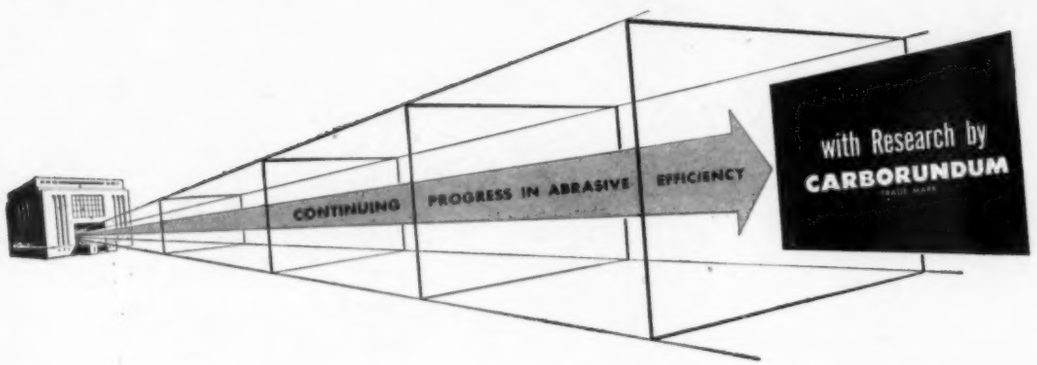
1

WITH this brand new handbook—over 130 pages of practical information—it tells you how to select the most suitable type of diamond wheels for each carbide tool grinding job and how to get maximum life from each diamond wheel. Also covers the use of Crystolon (silicon carbide) wheels.


2
WITH these two new motion picture films in the Norton series "Lessons in Grinding"—Running about 20 minutes each, these sound and color films are a "must" for every shop using carbide tools—ideal for foremen groups, shop training classes, technical societies, vocational schools.
THE DIAMOND WHEEL
Its Care and Use
GRINDING CARBIDE TOOLS
NORTON ABRASIVES
NORTON COMPANY . . . Worcester 6, Mass.
To help us get more service from our diamond wheels please send:
☐ Your handbook "Grinding Carbide Tools"
☐ Booking information on your two new films.
Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

A BUYING GUIDE FOR ABRASIVES

POINT No. 8

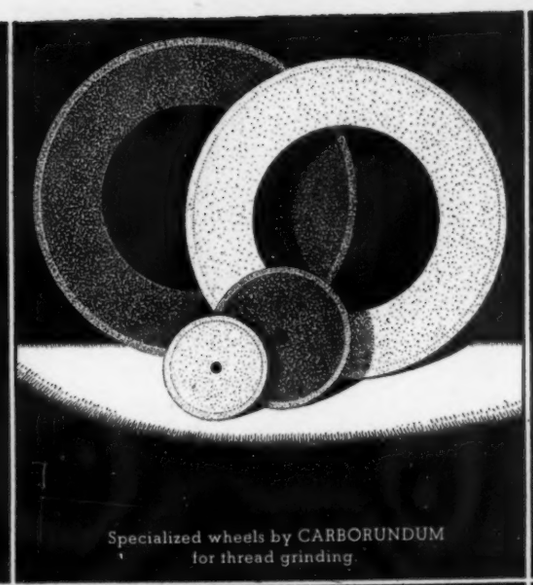


Research and Development

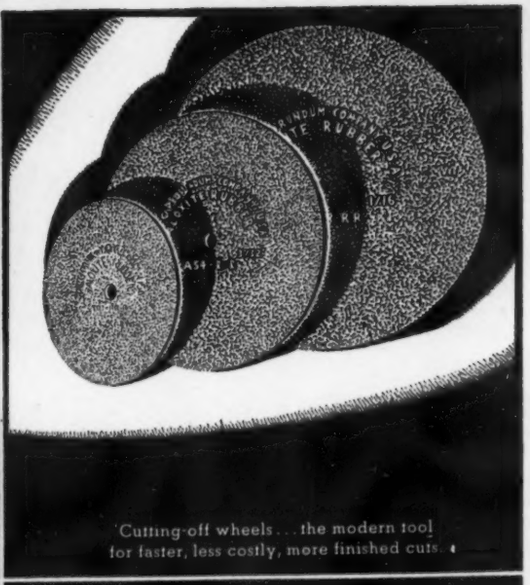
The Carborundum Company is considered a good source of supply for abrasive products because of its outstanding research accomplishments. Research at The Carborundum Company is aimed at developing uniform abrasive products that cut faster...cut cooler...grind more pieces per wheel ...improve the finish and, in other ways, improve grinding efficiency.

Because abrasive research is part of the very foundation of The Carborundum Company, users can rely on abrasives by CARBORUNDUM as being in the forefront of technical improvement. It is this assurance which leads so many manufacturers, noted for production efficiency, to prefer abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

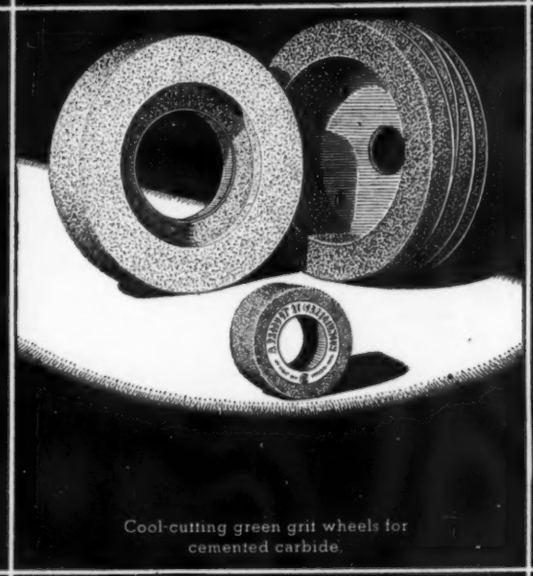
A Good Rule for Good Grinding



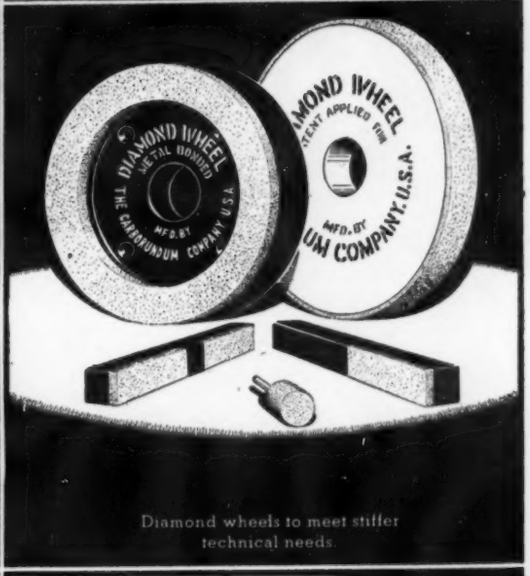
Specialized wheels by CARBORUNDUM for thread grinding.



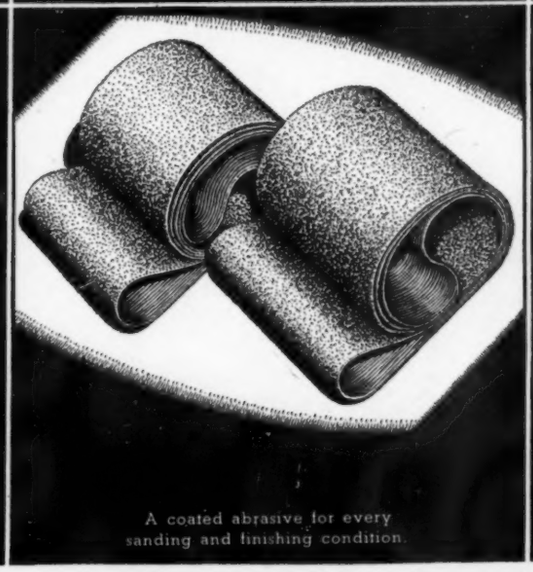
Cutting-off wheels . . . the modern tool for faster, less costly, more finished cuts.



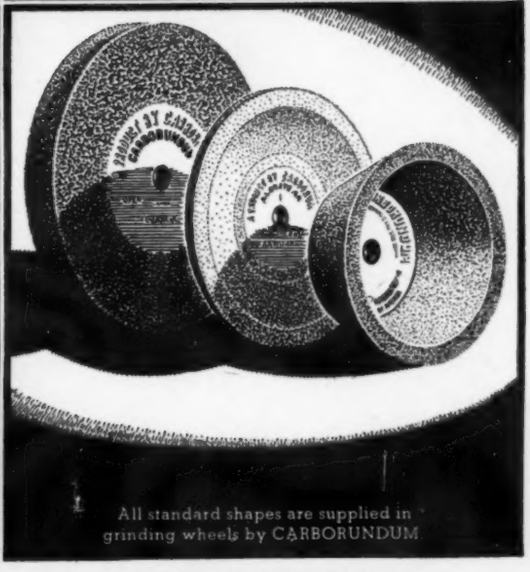
Cool-cutting green grit wheels for cemented carbide.



Diamond wheels to meet stiffer technical needs.



A coated abrasive for every sanding and finishing condition.



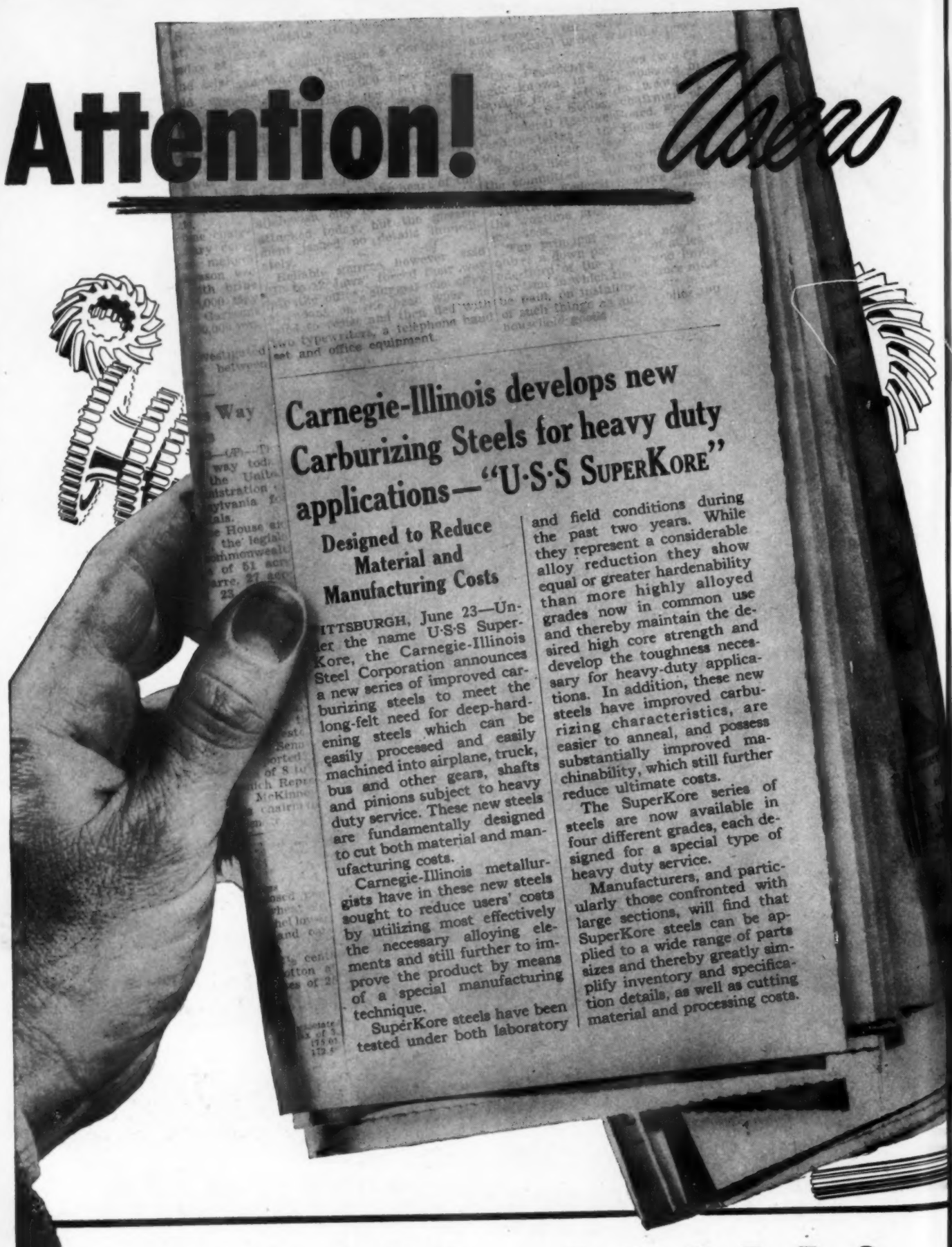
All standard shapes are supplied in grinding wheels by CARBORUNDUM.

. . . CALL IN CARBORUNDUM

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

Attention!



Carnegie-Illinois develops new Carburizing Steels for heavy duty applications—"U·S·S SuperKore"

Designed to Reduce Material and Manufacturing Costs

PITTSBURGH, June 23—Under the name U·S·S SuperKore, the Carnegie-Illinois Steel Corporation announces a new series of improved carburizing steels to meet the long-felt need for deep-hardening steels which can be easily processed and easily machined into airplane, truck, bus and other gears, shafts and pinions subject to heavy duty service. These new steels are fundamentally designed to cut both material and manufacturing costs.

Carnegie-Illinois metallurgists have in these new steels sought to reduce users' costs by utilizing most effectively the necessary alloying elements and still further to improve the product by means of a special manufacturing technique.

SuperKore steels have been tested under both laboratory and field conditions during the past two years. While they represent a considerable alloy reduction they show equal or greater hardenability than more highly alloyed grades now in common use and thereby maintain the desired high core strength and develop the toughness necessary for heavy-duty applications. In addition, these new steels have improved carburizing characteristics, are easier to anneal, and possess substantially improved machinability, which still further reduce ultimate costs.

The SuperKore series of steels are now available in four different grades, each designed for a special type of heavy duty service.

Manufacturers, and particularly those confronted with large sections, will find that SuperKore steels can be applied to a wide range of parts sizes and thereby greatly simplify inventory and specification details, as well as cutting material and processing costs.

UNITED STATES

# of Carburizing Steels

U·S·S SUPERKORE STEELS—properly applied—have the following advantages...

—they cost less than more highly alloyed carburizing steels.
—they improve hardenability . . . give deeper hardening.
—they reduce inventories necessary to do the job with present steels.
—they are easier to anneal.
—they have improved machinability.
—they have improved carburizing characteristics.

U·S·S SUPERKORE STEELS were developed to meet *specific* fabricating and performance requirements. That's why it is important that SuperKore Steels be properly applied.

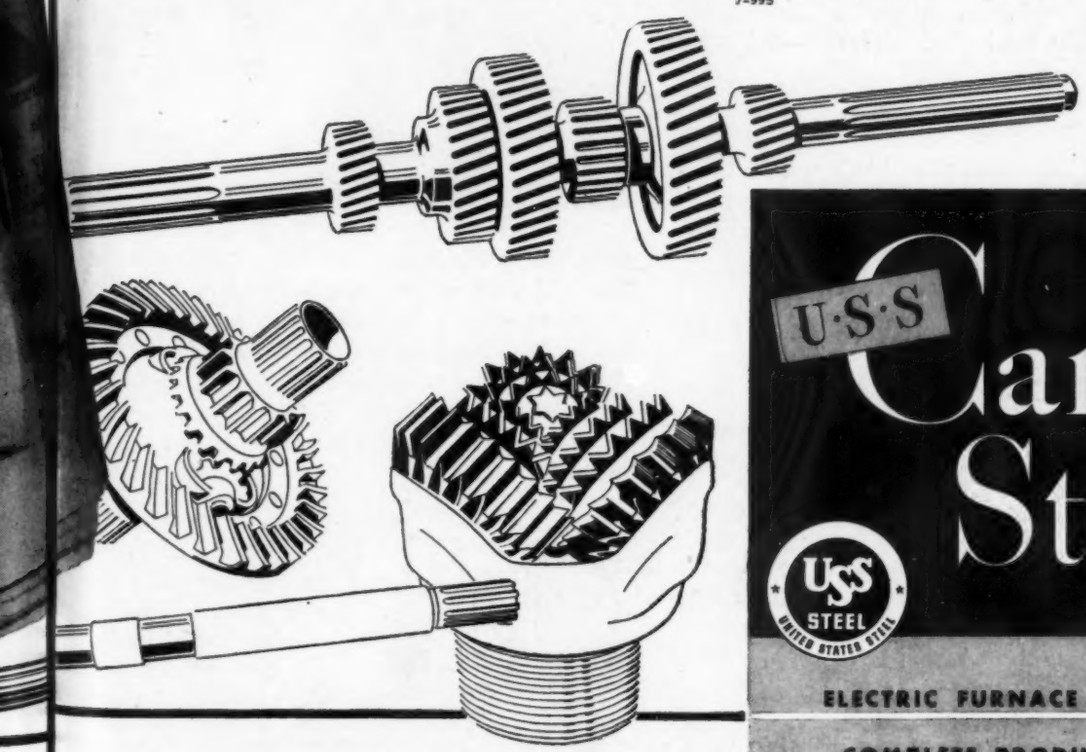
To get the full benefit of these steels in reducing the costs of your heavy-duty gears, shafts and pinions, the help of our service metallurgists —who developed U·S·S SuperKore Steels— is available to assist you in putting them to work on the right jobs, and to iron out any application problems involved in their use.

The new "SuperKore Booklet" provides further information on these steels. For your copy write direct to Carnegie-Illinois Steel Corporation, Carnegie Building, Room 470, Pittsburgh 30, Pennsylvania.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, Southern Distributors
United States Steel Export Company, New York
7-995



S T E E L

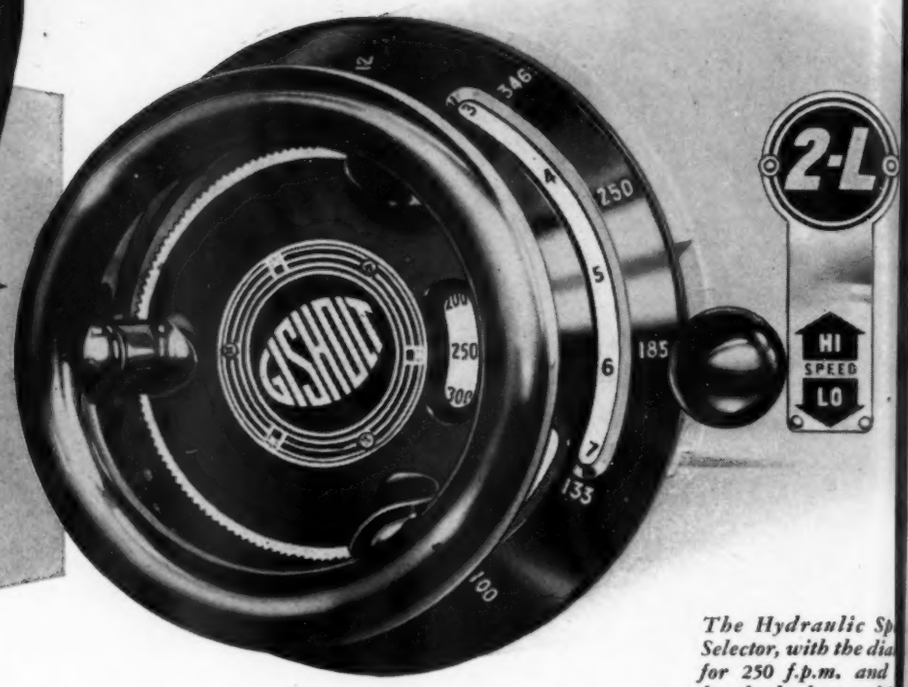
U·S·S Carilloy Steels

USS STEEL — UNITED STATES STEEL

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

HYDRAULIC SPEED SELECTOR



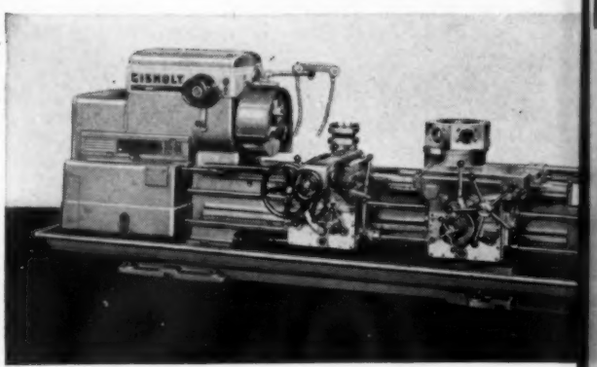
The Hydraulic Sp Selector, with the dia for 250 f.p.m. and hand wheel turned f cut of 5¾-inch diame

Now *Standard Equipment* on Gisholt Turret Lathes!

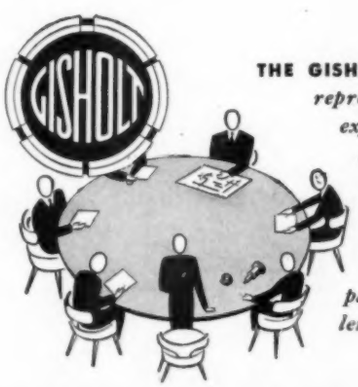
With a Gisholt you can obtain any one of 12 spindle speeds, instantly, without releasing the main drive clutch—without even stopping the spindle!

With the Hydraulic Speed Selector, you don't waste time and effort between cuts. Merely set the dial for the cutting speed you wish, then turn the hand wheel for the proper diameter. You pre-select the speed and diameter for the next cut while this one is being made. And when it's time to change—just tap the trip lever!

Easy? Of course. But more than that, the Gisholt Hydraulic Speed Selector is a big step toward maximum production at rock bottom cost.



GISHOLT 2L HIGH PRODUCTION SADDLE TYPE TURRET LATHE—*Product of a half century devoted to the finest class of metal-working equipment, the Gisholt 2L is designed for the maximum speeds and feeds cutting tools will withstand. Incorporated in its rugged design are a number of simple, power operated controls designed to cut time and effort to a minimum. Write for full details.*



THE GISHOLT ROUND TABLE *represents the collective experience of leading specialists in the machining, surface-finishing, and balancing of round and semi-round parts. Bring your problems here.*

GISHOLT MACHINE COMPANY

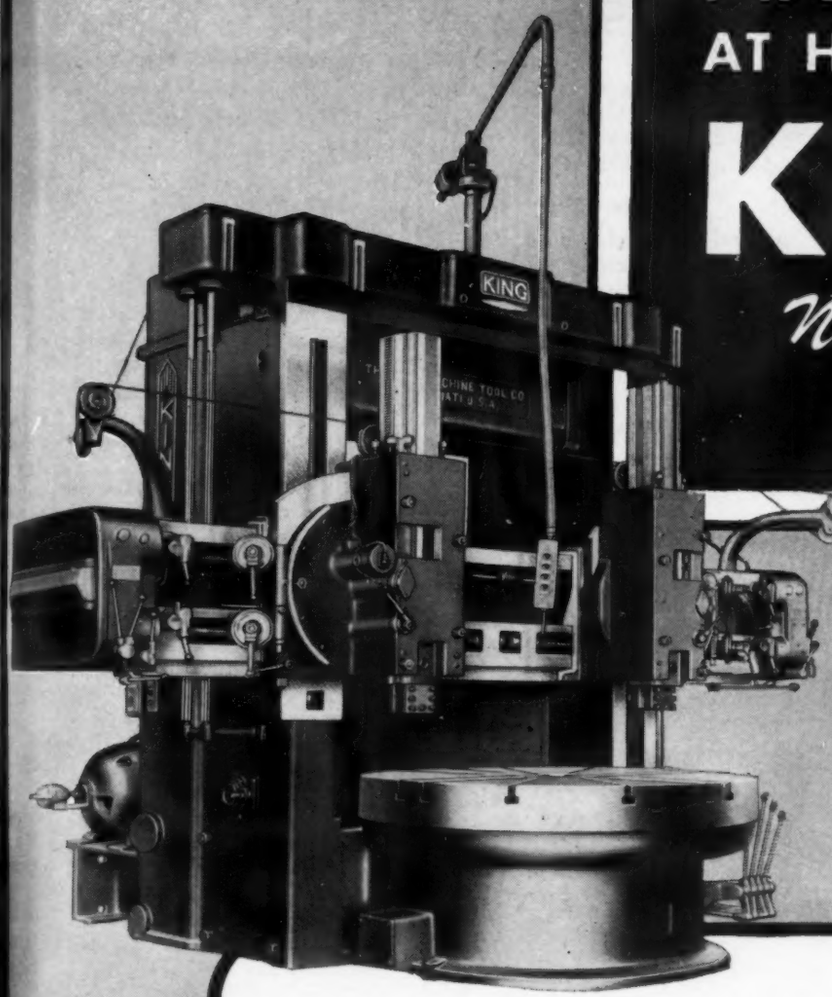
1245 E. Washington Ave. • Madison 3, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

PRECISION AT HIGH SPEED

KING

New Series 72 inch



● One of the basic reasons for the extremely accurate production from this new series KING stems from its substantially increased weight and rigidity.

For example this increased weight and new, massive rectangular type ram heads give you ample rigidity to use carbide tools to their limit. This construction plus the increased speed range provides both accuracy and flexibility of operation. All of which boils down to lower costs and higher production.

The New Series KING is available in the following sizes—30", 36", 42", 52", 62", 72", 84", 100", 120" and 144". Write for complete details.

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines Exclusively

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Goodyear Tire & Rubber Co. are making a 30-foot rubber electric heating pad to dry the inks used in printing textile fabrics.

get ready with CONE for tomorrow

Farnsworth Television & Radio Corporation has the "Utiliscope", a television set that shows, in any room, a continuous picture of operations in a remote, inaccessible or dangerous part of a plant.

be ready with CONE for today

The Moore School of Engineering of U of P is building an electronic computor. It is reported that this new machine is faster than the famous ENIAC, will remember fifty times as many numbers and uses only 3,000 tubes, instead of 18,000.

get ready with CONE for tomorrow

The new Blaw-Knox equipment pulverizes coal by self-abrasion in a blast of super-heated steam.

be ready with CONE for today

The Marmon-Herrington 44-passenger trolley bus uses light metals to reduce weight to 17,230 pounds.

get ready with CONE for tomorrow

General Electric Company has two steam turbine generators under construction for electric power companies. These will use steam at 2,000 pounds pressure and 1,050 degrees and develop 125,000 kilowatts.

be ready with CONE for today

Western Pine Association hopes to cut lumber drying time to 4 hours by the use of acetone spray.

get ready with CONE for tomorrow

Flaw-free 90° creases can now be formed in thermoplastic sheet of .005" to .020" thickness up to 30" wide on a repetitively uniform, high-speed production basis with a newly designed machine incorporating thermostatically controlled "instant-crease" action developed by the Sheet Plastics Equipment Division of Taber Instrument Corporation.

Dow Latex 512 is offered as an immediately available substitute for linseed and other vegetable oils.

get ready with CONE for tomorrow

In a new method of bridge building, developed at the University of Illinois, the concrete roadway is rigidly connected to the steel structure. This "composite construction" is said to save 30% in the weight of steel beams used.

be ready with CONE for today

Shell Chemical Co. has plans for the commercial production of glycerin from petroleum in 1948.

get ready with CONE for tomorrow

National Carbon Co. claims that its new flashlight cell has double the capacity of previous cells due to improved chemical mixture.

Commonwealth Edison Co. has a "cyclone" burner in its Calumet Station that removes 80% of the coal ash as molten slag in the burner.

be ready with CONE for today

Improvements and innovations in multiple spindle automatic bar machine design will be represented by the new models on display at the Cone Automatic Machine Co. booth at the Chicago Machine Tool Show.

get ready with CONE for tomorrow

Link-Belt Company's Electro-fluid Drive is a combination of electric motor and the familiar "fluid flywheel". It reduces the starting load, cushions shocks and prevents damage from overload.

be ready with CONE for today

Experimental work on a process for forming cold bonderized sheet steel under pressures as high as 230,000 psi is being conducted by Heintz Manufacturing Co. of Philadelphia. If successful, the process may greatly reduce the cost of many common steel articles.

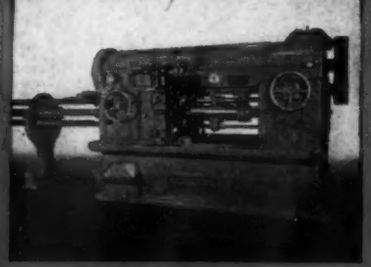
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Put the *usual* jobs on any automatic.

Put the *particular* jobs on a CONE.

From 1⅞" dia. SAE 1112 a 6-Spindle Conomatic produces the part shown in 44 seconds.

See the CONE *booth at the Machine Tool Show.*



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

41

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS for BROWN & SHARPE machines

The name Hardinge symbolizes accurate, durable and low cost precision accessories for Brown & Sharpe Automatics and Wire Feed Screw Machines. Specify Hardinge products to obtain maximum production efficiency.

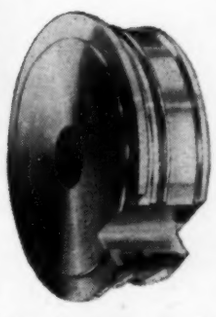
Make certain you have our bulletins for the precision products shown. If not, write for complete descriptive literature, specifications and attractive prices. Purchasing, Engineering, and Production Departments welcome Hardinge Bulletins — they simplify ordering.

STOCK DELIVERY

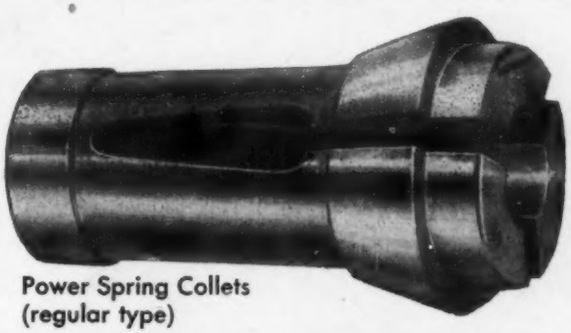
HARDINGE BROTHERS, INC.

ELMIRA, N. Y.

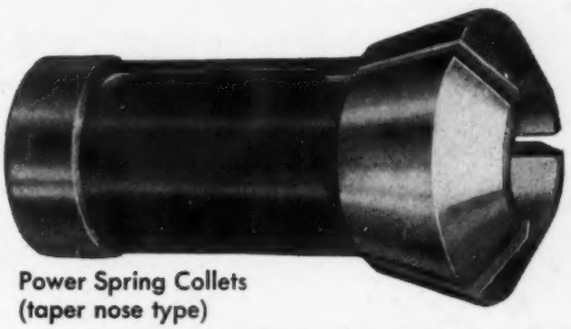
Circular Cut-off Tools



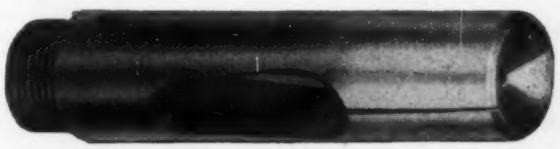
Circular Form Tools



Power Spring Collets
(regular type)

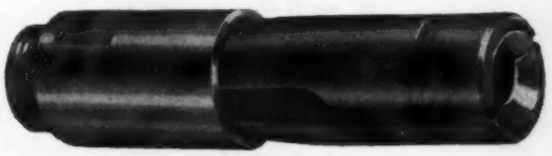


Power Spring Collets
(taper nose type)



Feed Fingers (regular type)

Master Feed Fingers and Pads



Master Feed Fingers
with Adjustable Tension

CAPACITY

Designed for a new range of work, the new 3U SPEED-FLEX handles work up to 6" in diameter. Swing over cross slide is 8-3/4"; cross slide travel each way is 2-1/2" and turret slide travel is 6". Spindle is adjustable in headstock, providing variation of distance between spindle nose and turret faces.

FLOOR SPACE

Takes only 16 square feet of floor space. Permits compact, efficient production line installations.

P&J

P. & J. Automatics will be Demonstrated in Action
BOOTH #43
MACHINE TOOL SHOW
Chicago — Sept. 17-26

POTTER & JOHNSTON

RIGIDITY

Rigid, box type base has hardened and ground steel ways and hardened and ground steel inserts in the turret slide. Turret automatically clamped in alignment after indexing by locking and binding wedge. Overhead piloting arrangement easily installed. Designed throughout to take full advantage of tungsten carbide tools.

RANGE

Standard spindle speed range from 73-1445 R.P.M. Optional dual range of 36-711 and 73-1445 R.P.M. also available. Turret slide feed ranges from .0023" to .0684". or from .0042" to .125" per spindle revolution. Four automatic changes of spindle speed and three automatic feed changes with each set of hand pick-off gears.

3U SPEED-FLEX

THE NEWEST, FASTEST P & J AUTOMATIC TURRET LATHE

CONVENIENCE

All speed and feed changes are made by solenoid controlled, air operated, multiple disc clutches. Dogs on control drum can be set very closely, reducing non-cutting portion of the cycle to a minimum. Bijur lubrication of turret slide and bed ways. Full electrical controls. Complete safety features for protection of operator and machine.

SPEED

Split second timing permits change from rapid traverse to feed, or vice versa, in 1/5 second. Turret slide can drop from rapid traverse into feed for 1/4" of travel and back to rapid traverse in 2 seconds, using top speed and .010" feed. Rapid traverse movement of turret slide and cross slide for one complete cycle of machine is only 24 seconds.

MACHINE COMPANY, PAWTUCKET, R. I.

Announc

A change in name for a pioneer in the design and manufacture of a FINE LINE OF PRODUCTS

LATHE CHUCKS . . . CENTERING MACHINES . . . GEAR CUTTING MACHINES . . . STEAM TURBINES

formerly made by

The D. E. WHITON CO.

are now being made, sold and serviced by

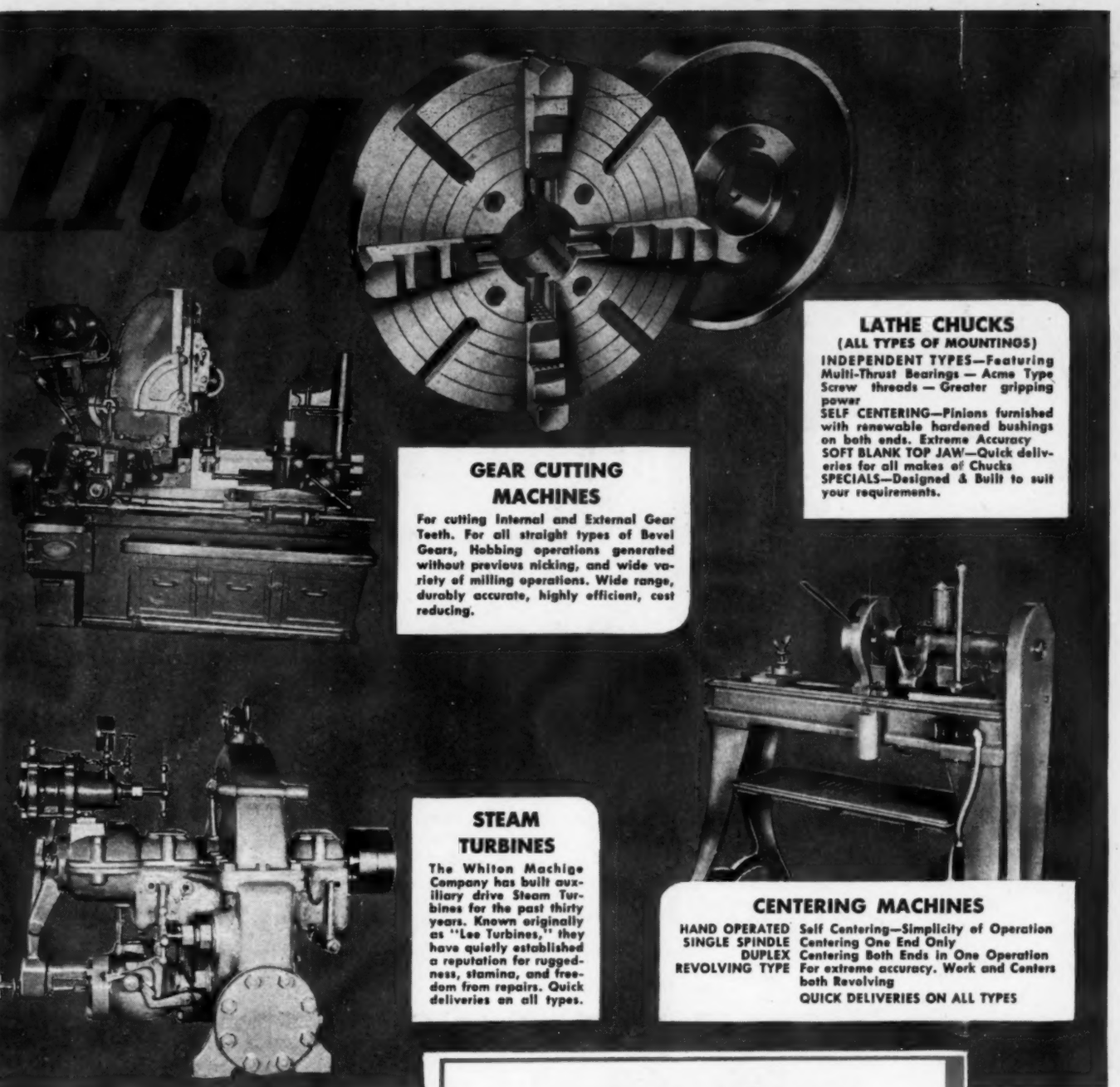
THE WHITON MACHINE COMPANY

The original company bearing the "Whiton" name was founded in 1856, in West Stafford, Connecticut, for the manufacture of centering machines. In 1866, this company purchased a small local industry and the first Whiton Chuck was patented. In 1886, the company was incorporated and moved to New London, Connecticut. Shortly thereafter The Whiton Gear Cutter was designed and made available for industrial ue. Steam turbines for auxiliary service were a later product of the Whiton organization and like all Whiton-built machines have long since established an enviable reputation for outstanding service.

On May 1, 1947 a new corporation, known as The Whiton Machine Company took over the properties of the former D. E. Whiton Machine Company. Its new president, Mr. George A. Highberg, is well-known in the metal working field, having been Vice President and factory manager of a leading chuck manufacturer. A high standard of leadership is thus assured.

The policy of the new owner-management will be to maintain the high quality of all products bearing the "Whiton" name and to draw on long experience and finest engineering skill in the development of these products to meet current and future production needs. The basis of all endeavor will be to render the utmost in service to every branch of metal working . . . to make the "Whiton" name synonomous with the most modern practice in each of the fields served by its products.

You are invited to take advantage of the cooperation now available through the expanded "Whiton" engineering department.



LATHE CHUCKS
(ALL TYPES OF MOUNTINGS)
INDEPENDENT TYPES—Featuring Multi-Thrust Bearings — Acme Type Screw threads — Greater gripping power
SELF CENTERING—Pinions furnished with renewable hardened bushings on both ends. Extreme Accuracy
SOFT BLANK TOP JAW—Quick deliveries for all makes of Chucks
SPECIALS—Designed & Built to suit your requirements.

GEAR CUTTING MACHINES
For cutting Internal and External Gear Teeth. For all straight types of Bevel Gears, Hobbing operations generated without previous nicking, and wide variety of milling operations. Wide range, durably accurate, highly efficient, cost reducing.

STEAM TURBINES
The Whiton Machine Company has built auxiliary drive Steam Turbines for the past thirty years. Known originally as "Lee Turbines," they have quietly established a reputation for ruggedness, stamina, and freedom from repairs. Quick deliveries on all types.

CENTERING MACHINES

HAND OPERATED	Self Centering—Simplicity of Operation
SINGLE SPINDLE	Centering One End Only
DUPLEX	Centering Both Ends in One Operation
REVOLVING TYPE	For extreme accuracy. Work and Centers both Revolving

QUICK DELIVERIES ON ALL TYPES

A MESSAGE TO DEALERS

Dealerships for "Whiton" products are now being established in many territories. The comprehensiveness of the "Whiton" line, its sales potential and its national reputation and acceptance make it an unusually attractive one for qualified distributors and dealers to handle. Ask for details concerning the "Whiton" Sales Franchise.

THE WHITON
MACHINE COMPANY
New London, Conn.

1856-1947
Continuing a
91 YEAR REPUTATION
for
Leadership

Put it on the Blanchard

For a saving of *10* hours on each milling machine universal saddle

FORMERLY the two halves of this cast iron milling machine universal saddle were scraped together—an 11-hour operation.

The size is not important on this job. But the finish *must* be good and the ground surface *must* be flat and parallel with respect to the ways, within .0003 inch.

now: To eliminate the laborious and costly scraping-in of the two halves of the saddle, each half is now set on parallels and ground on the 36-inch chuck of a No. 18 Blanchard Surface Grinder. The illustration shows the top half of the saddle set up for grinding.

Each saddle half is now Blanchard-ground in 25 minutes — to fully and easily meet the rigid specifications. The 50-minute total for this job represents a SAVING OF MORE THAN *10* HOURS per saddle.

It will pay you to investigate whether you are producing flat surfaces at a much greater cost than necessary. Our Consultation Service will gladly help you with advice, reliable production data, fixture design if necessary and sample grinding. Simply send us the data—including prints and, if practicable, samples. You will incur no obligation.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

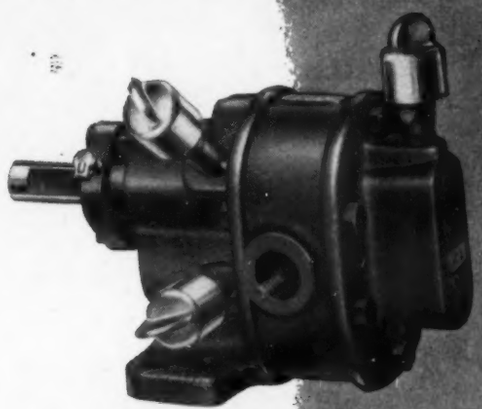
PUMPS that Match YOUR standards...

WHENEVER you are designing or redesigning equipment that requires pumps for cooling, lubricating or hydraulic systems, insure your standards of quality and performance with Brown & Sharpe precision-built pumps. You can count on them for efficient, trouble-free, long-life performance . . . the result of practical designing, sound construction, and many years of experience in building and operating pump-equipped machines.

Brown & Sharpe Pumps are made of selected materials. Their parts are generously proportioned and those subject to wear are designed to give long, continuous service.

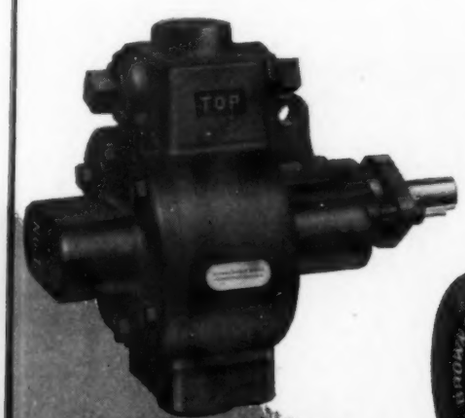
Get acquainted with the specific facts and performance figures of the complete line of Brown & Sharpe Pumps . . . Rotary Geared, Vane, Centrifugal and Motor Driven. If you have a pump problem that requires a special design, Brown & Sharpe may have a solution. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

No. 00 Rotary Geared Pump . . . supplies oil for lubrication or for coolant where small capacities are desired.



No. 21 & 23 Bronze Rotary Geared Pumps. Designed for use where a corrosion-resisting pump is required.

The 500 Series Rotary Geared Pumps for hydraulic installations are designed to be driven direct, run quietly at high speeds for pressures up to 500 psi.



Nos. 11, 12 and 13 Rotary Geared Pumps, Reversible Type. Maintain same direction of delivery when rotation is reversed. Specially adapted to machines which operate in both directions.

No. 8 Reversible Type Vane Pump, used to circulate coolant to cutting tools of light metal working machines or as a lubricating pump. Maintains same direction of flow when shaft rotation is reversed.

B·S

We urge buying through the Distributor

Climb on the SIMONDS "BAND-SAW WAGON"

Save Thousands of Hours by Band-Saw Cutting . . . instead of Shaping, Milling, Turning, Drilling

Getting to be a "Big Parade" . . . the way shops are swinging to metal band-sawing . . . and keeping their one-purpose machines free to do the work for which they were designed.

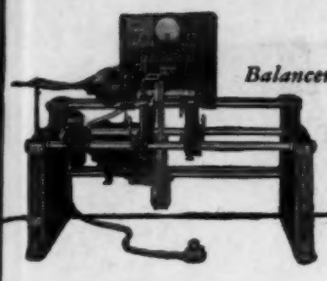
Simonds Metal-Cutting Band Saws can do a score of jobs, and do them all at top speed and accuracy . . . cut-off work, contour cutting, and cutting of irregular shapes like jigs, dies, fixtures, as well as heavy straight production cuts . . . and many other similar jobs.

And Simonds Metal Bands earn top profits on these jobs because they're made to *stay* on the job many hours longer . . . running smoothly, easily, cleanly. Simonds special steel, perfect tooth-milling and even tooth-set . . . those are the Simonds *extras* that *pay you extra* on every Simonds Metal Band you buy. Order from your distributor today.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

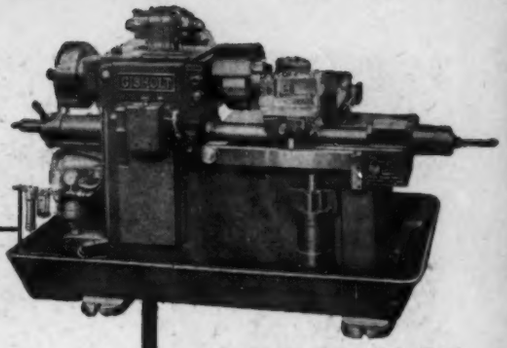
SIMONDS — Special Electric Furnace Steels
SIMONDS — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.



Balancers

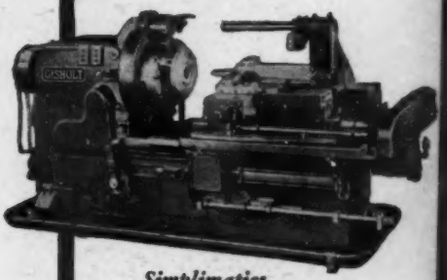
Superfinishers



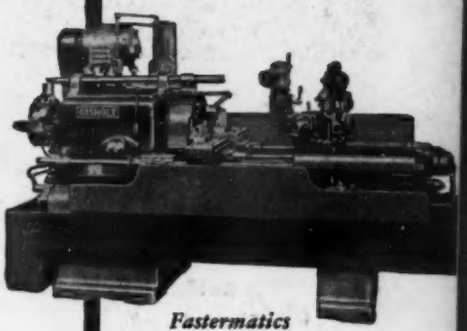
Hydraulic Automatic Lathes

If you produce parts that are Round or Partly Round

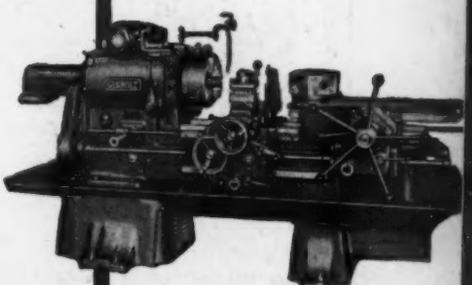
meet us at the "GISHOLT ROUND TABLE"



Simplimatics



Fastermatics



Ram Type Turret Lathes

Yes, for a half century, here at Gisholt, we've concentrated our efforts upon the building of equipment to produce parts that are round or partly round. And a good share of our job is helping others to use it most efficiently.

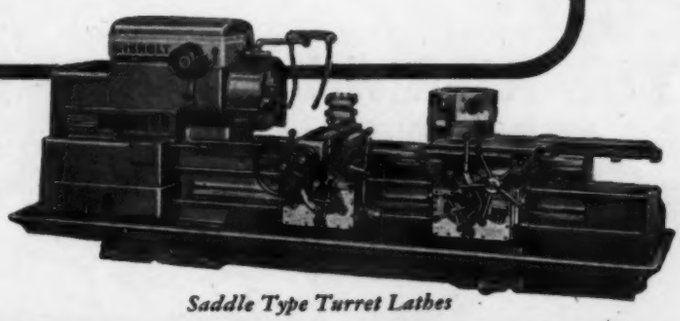
There's where the "Gisholt Round Table" comes in—as a clearinghouse for practical ideas. Gisholt engineers live with production problems day in and day out, visiting hundreds of plants each year. Whatever your work may be in the realm of machining, surface-finishing or balancing of round or partly round parts, Gisholt specialists will gladly help you.

Now, and in the years ahead, more emphasis than ever will be placed upon better methods, increased efficiency and lower costs.

Call your nearest Gisholt Representative. Or, if you wish, come to Madison and consult the "Gisholt Round Table."

GISHOLT MACHINE COMPANY
Madison 3, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS
BALANCERS • SPECIAL MACHINES



Saddle Type Turret Lathes

See all these—and other Gisholt machines on actual production jobs at the Machine Tool Show.

SKILLED GEAR CRAFTSMEN . . . MODERN GEAR CUTTING MACHINES . . .

. . . build quality and dependability into every ADAMS GEAR

the ADAMS line

- SPUR GEARS
- HELICAL GEARS
- BEVEL AND MITER GEARS
- WORMS AND WORM GEARS
- SPROCKETS
- INTERNAL GEARS (Spur and Helical)
- RATCHETS
- SPLINED SHAFTS
- RACKS
- LEAD AND FEED SCREWS
- GROUND TOOTH GEARS (Spur and Helical)
- SHAVED TOOTH GEARS (Spur and Helical)
- GROUND THREAD WORMS

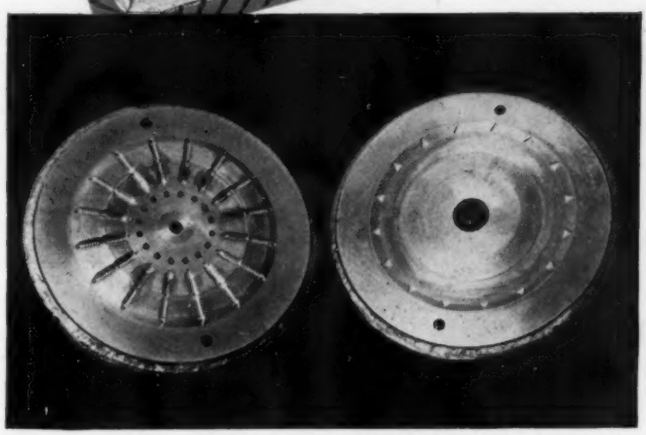
It takes experienced men and fine machines to make really good gears—Adams has both. In addition, Adams gears are quality controlled at every stage in their manufacture to assure exact conformance with your specifications. This extra care means better performance for your product. And in many cases, custom made gears, designed especially for the application, will cut assembly time and lower unit costs. Write for complete information today. THE ADAMS COMPANY, 1942 Bridge St., Dubuque, Iowa.

The ADAMS Company
Dubuque, Iowa, U. S. A.

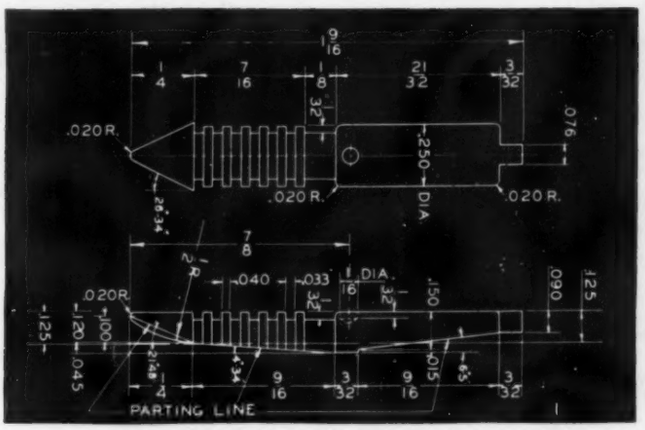
GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . . . ESTABLISHED 1883.

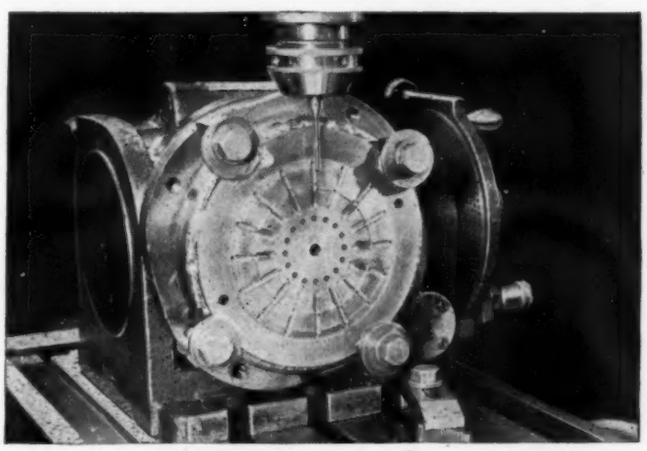
How to Mill an intricate 16-Cavity Injection Mold complete.. averaging 8 3/4 hours per cavity!



FAST! Both halves of this 16 cavity injection mold for an ink feed part for desk pens milled complete and ejection pin holes spotted in 140 hours! That's typical performance of a Kearney & Trecker — Milwaukee Model 2D Rotary Head Milling Machine on difficult mold making jobs.



DIRECT! These multiple contours were transmitted direct from print to mold block. No fussing with templets or models. One cavity accurately located and each operation successively duplicated after indexing on a dividing head. That's the Rotary head method of "multiple origination."



ACCURATE! Single setup reduced chance for error. Operator relied on built-in precision control and measuring devices for precise end results. Ejector half tipped 90° and special cutter used to square groove corners.

Job Data Courtesy of
Senghusch Self Closing Inkstand Company

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN 4718

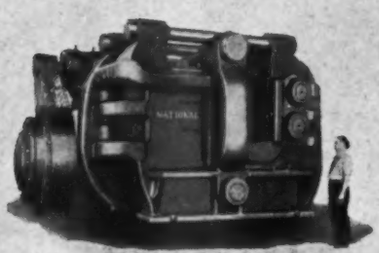
For more facts of how you can get Fast, Direct, Accurate results on other mold, tool, die, pattern, toolroom and general production work, using the Rotary Head Method, write for bulletin 1002C on the Model 2D Rotary Head Milling Machine.

PEACETIME IDEA?

This Venturi end of a Rocket Bomb is cold extruded and hot upset on tubing on a National High Duty Forging Machine with speed and accuracy.

It may suggest a peacetime product which you can handle to advantage by National technique.

We will welcome the opportunity to help you investigate the possibilities.

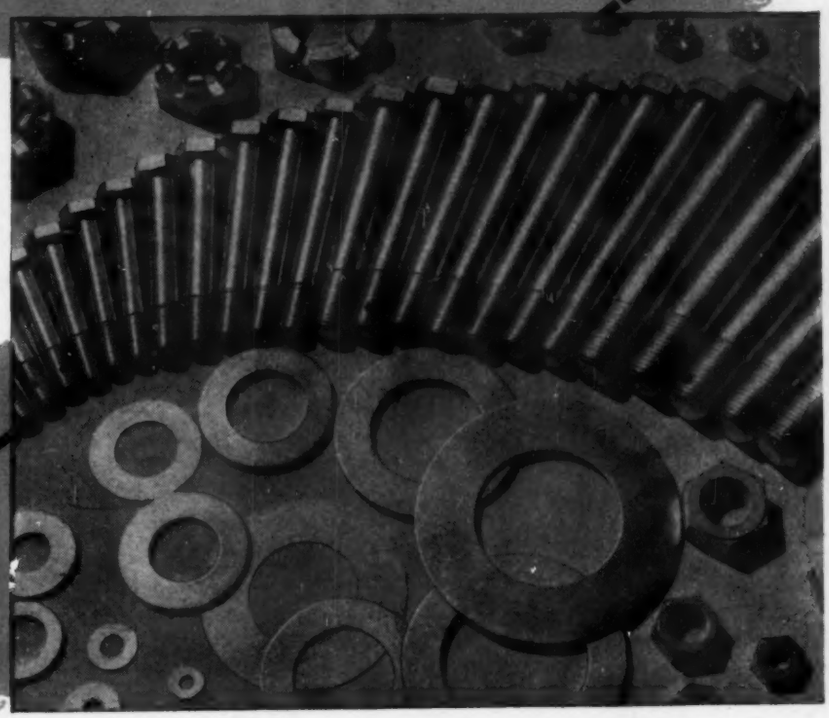


NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

NO RUST WORRIES



It's made of Aluminum, fastened with Alcoa Aluminum Bolts, Screws, Nuts

Go aluminum the whole way! When you assemble aluminum parts, fasten them together with aluminum . . . Alcoa Aluminum Bolts, Screws, Nuts, and Washers. Then you'll get the advantages of aluminum all the way through your product. Here they are:

- High strength-weight ratio of Alcoa Aluminum Fasteners.
- No rusting of fasteners to weaken the assembly and spoil painted surfaces.
- No binding and freezing of fasteners to make inspection and repairs difficult.
- No need for insulation and protection to prevent galvanic corrosion between aluminum and dissimilar metal fasteners.
- Uniformly good appearance of the assembly without painting the fasteners.
- Complete line of standard threads, sizes, types, and alloys to fit all needs.

They're available NOW from your nearby Alcoa Aluminum Distributor. Or write to: ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in 55 leading cities.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

New rigidity and power for today's cutting materials

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

NEWTON 8 SPINDLE TWO-STATION UNIT HEAD ROTARY MILLING MACHINE

Designed for high production milling of Automotive Cylinder Blocks and heads, transmission cases, and similar parts, this machine is equipped with two sets of roughing and two sets of finishing spindles with operating stations on each side of the machine, making possible twice the productive capacity of the conventional single station machine.

WILLIAM SELLERS & COMPANY MACHINE TOOLS
are now built by the
WILLIAM SELLERS DIVISION,
CONSOLIDATED MACHINE TOOL CORPORATION

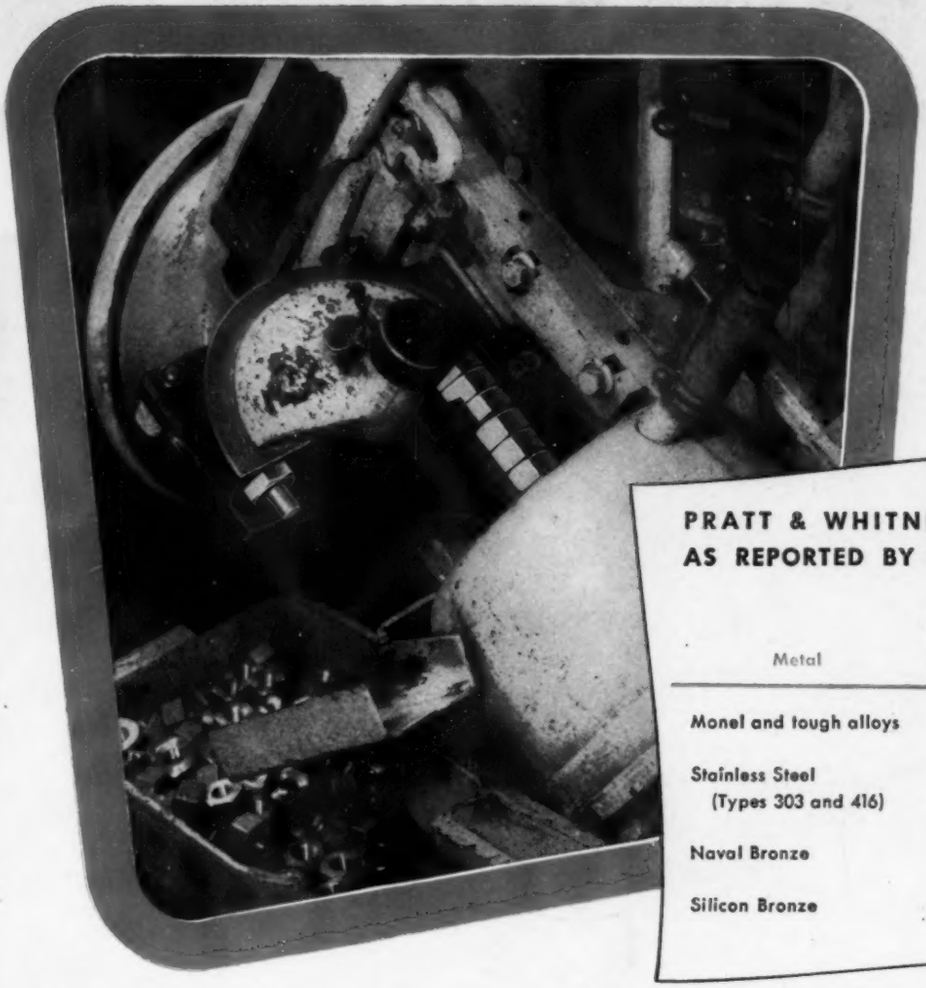
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 186

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Silicon bronze nuts, both formed and milled, were threaded on a National Precision Bent Tapper equipped with a P&W ¾"-10 NC hook tap and nib at a 45% reduction in tap costs for H. M. Harper Co., Chicago.

The H. M. Harper Co. also uses P&W improved sectional type taps to thread stainless steel and other tough alloys.

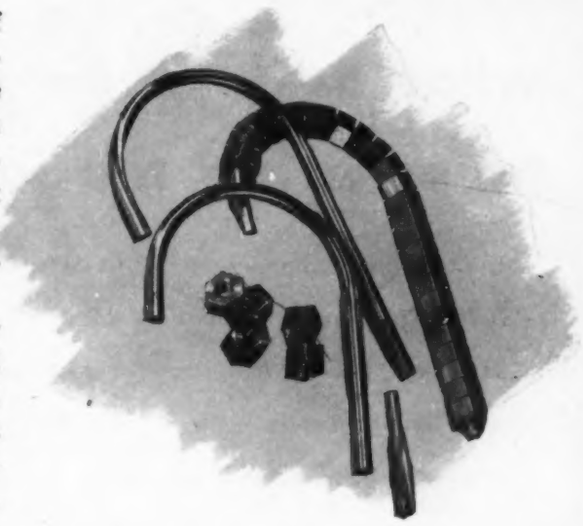
PRATT & WHITNEY TAP PERFORMANCE AS REPORTED BY THE H. M. HARPER CO.

Metal	P&W Tap Life in Hours	Percent of Increase Over Previous Tap Life
Monel and tough alloys	40-45 hours	150
Stainless Steel (Types 303 and 416)	50-55 hours	200
Naval Bronze	70-80 hours	200
Silicon Bronze	40-45 hours	300

P&W Tap Engineering in Action

Tapping results like these are not unusual—hundreds of other manufacturers are profiting from P&W tap engineering in action—because P&W taps are *engineered for the job.* Only experienced specialists like P&W engineers can develop designs and heat treating methods that deliver long-lived, free-cutting taps. Only a background like Pratt & Whitney's can provide manufacturing facilities which meet the demand for accurate, job-tested cutting tools of a uniformly high quality.

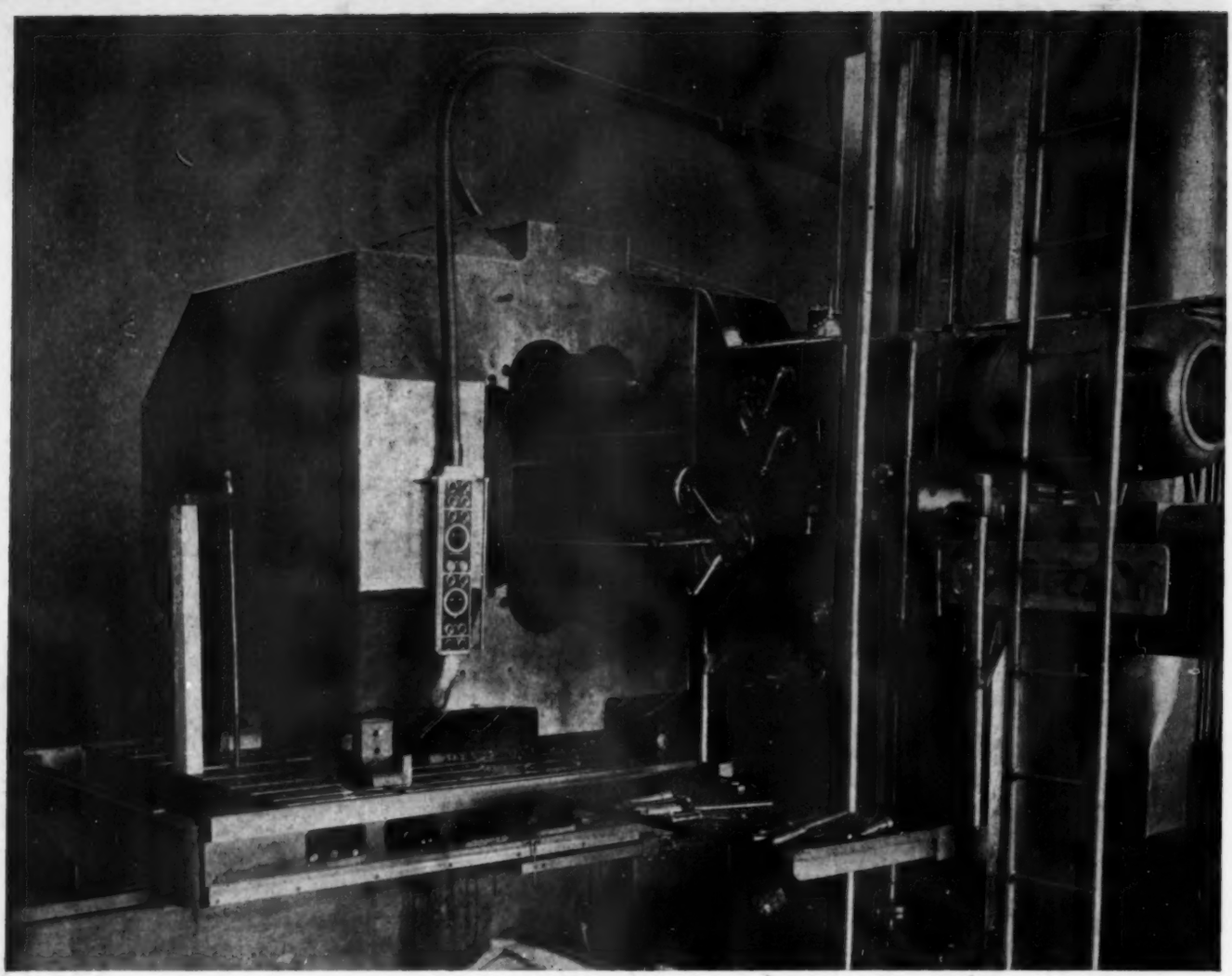
Pratt & Whitney taps are available in either carbon or high-speed steel, and with cut threads, commercial ground threads, or precision ground threads—tailored to give you the accuracy required. Let a P&W engineer help you cut costs, reduce breakage, increase speed on your tapping machines with P&W precision taps. Write for full information.



Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT



what a JOB! *and "what a mill" it takes to do the job properly . . .*

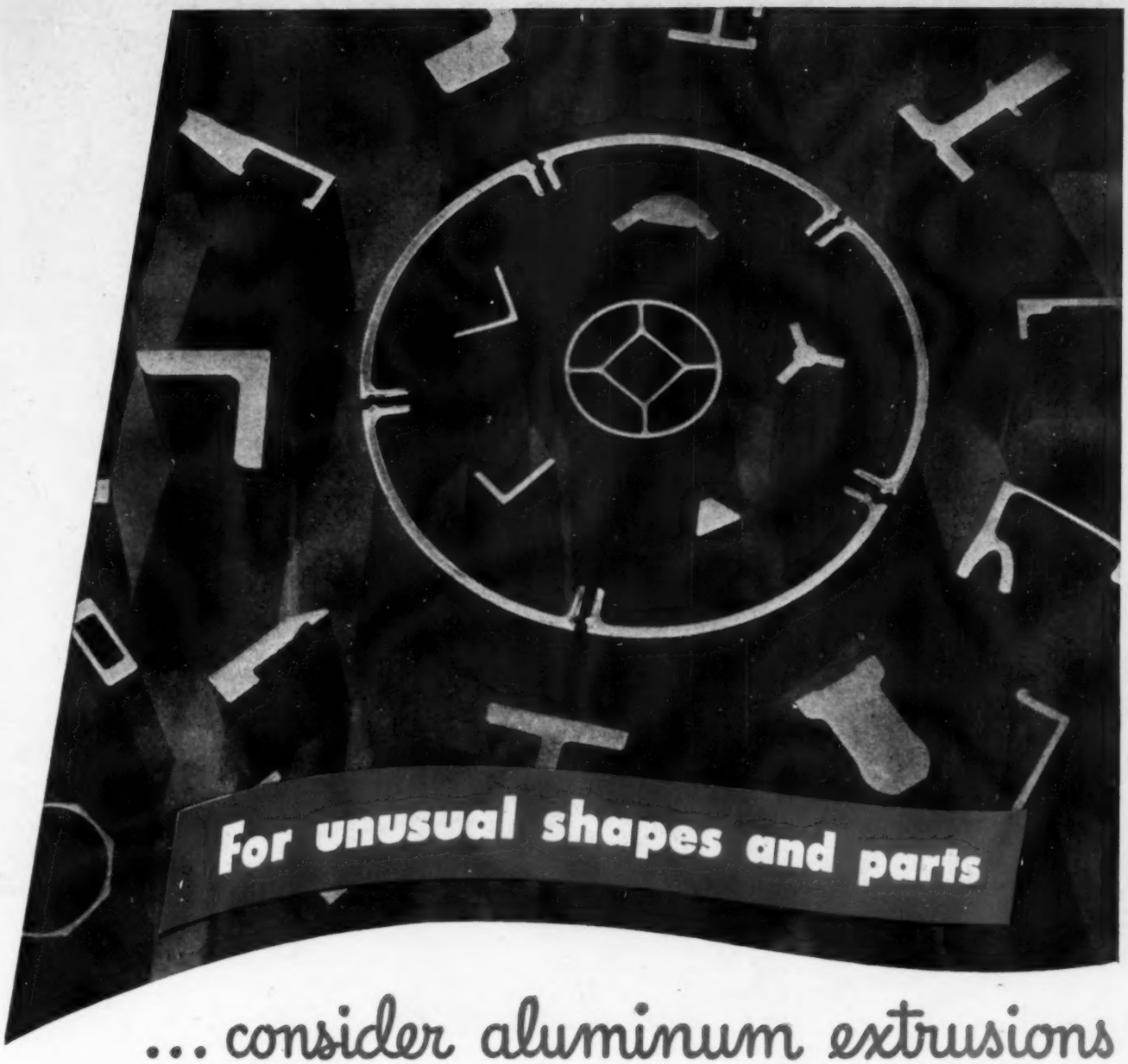
The task was to bore eight 15" diameter holes in the roll bearing housing of a 38-ton Sendzimir Rolling Mill, and hold it within .001" limits, in spite of the fact that they were segmental holes, and not bored from the solid.

The job was successfully performed on a Gray Planer Type Horizontal Boring Mill in the plant of the Waterbury Farrel Foundry and Machine Co., Waterbury, Conn.

The G.A. **GRAY** *Company*

CINCINNATI 7, OHIO, U. S. A.

planers • milling planers
planer type milling machines
horizontal boring machines



... consider aluminum extrusions

From decorative trim to structural members Reynolds Aluminum extruded shapes offer outstanding advantages.

Strong aluminum alloys, less than half the weight of steel, give a highly favorable strength-weight factor for such applications as airplanes, windows, molding, and furniture.

Extruded in a single operation, "building up" is completely eliminated, cutting costly time and labor charges.

Reynolds Aluminum Extruded Shapes are rustproof . . . strong . . . light. Many stock dies are available. Costs for special dies are low. Consult Reynolds engineers on adapting Reynolds Aluminum Extruded Shapes to your needs. Write Reynolds Metals Co., 2523 So. 3rd St., Louisville 1, Ky.

Among the many current uses for Reynolds Aluminum Extruded Shapes are:

Windows	Busses
Irrigation Pipe	Garden Tools
Furniture	Store Fronts
Aircraft	Refrigeration
Textile Machinery	Railway Cars
Truck and Trailer Bodies	

REYNOLDS METALS

REYNOLDS
THE GREAT NEW SOURCE OF **ALUMINUM**

2378

SOUTH BEND PRECISION TURRET LATHES

Cut Costs on 2nd Operation Work

Series 900 Precision Turret Lathe—$714.00, f. o. b. factory, less electrical equipment.

South Bend Series 900 Precision Turret Lathes are specifically designed for second operations on small parts. Their speed and accuracy appreciably contribute to lower machining costs.

Fast and easy to handle, these lathes give full freedom to the operator's producing power. There is no excessive mass or weight in moving parts to slow down handling and cause fatigue. Yet, they have ample rigidity and power for maximum machining efficiency on all work within their capacity. The Series 900 Precision Turret Lathes have a dependable accuracy that facilitates high speed machining to close tolerances and also reduces rejects. For example, the turret head indexes within plus or minus .0005", measured 4" from the turret face.

Precision Turret Lathes also made in 1" collet capacity models—Series 1000 with 10" swing, and Series 2-H with 16" swing. Quick Change Gear and Toolroom Lathes made with 9" to 16/24" swings.

PROMPT DELIVERY direct from factory.
PRICES of Precision Turret Lathes now substantially lower than prewar level.
TIME PAYMENT terms 25% down, 12 monthly payments. Moderate finance charge.

SPECIFICATIONS

Series 900 Precision Turret Lathe

Hole Through Spindle	¾"
Collet Capacity	½"
Swing Over Bed and Saddle Wings	9¼"
Swing Over Double Tool Slide	3 9/16"
Swing Over Compound Slide	5½"
Turret Tool Feed	4"
Turret Face to Spindle Distance	20⅜"
Double Tool Slide Travel (Combination handlever and power feed type)	3⅝"
Thread Cutting Range, 48 threads	4 to 224
Carriage Power Feeds:	
Longitudinal, 48	.0015" to .0853"
Cross-Slide, 48	.0004" to .0252"
Spindle Speeds, 12	41 to 1270

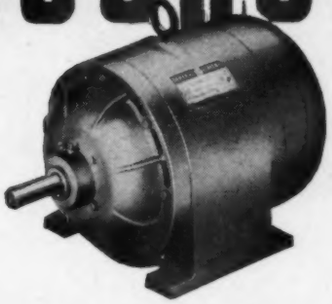
BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

5 BILLION MOTOR HOURS

PROVE YOU CAN'T BEAT



TRI CLAD

EXTRA PROTECTION

Announcement of the Tri-Clad motor, back in 1940, ushered in a new concept of general-purpose motor design. Substantially increased horsepower-per-frame-size was one feature. Smarter appearance was another. But what really sold more than a million Tri-Clad motors is the *extra protection* we built into them. Figured conservatively, they have delivered more than 5 billion hours of service.

Today, with the "family" including dripproof motors, vertical motors, gear-motors, capacitor-motors, and totally enclosed motors, the Tri-Clad motor is, more than ever, the motor that means basic protection, dependable performance, and minimum upkeep. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

***EXTRA PROTECTION*... AGAINST PHYSICAL DAMAGE!**

Rigid cast-iron frame and end shields protect vital parts from external abuse and prevent resonance. Because they're not at the mercy of a coat of paint, they strongly resist chemical attack and dampness. Cast iron also gives you tight, *metal-to-metal* fits between end shields and frame.

***EXTRA PROTECTION*... AGAINST ELECTRICAL BREAKDOWN!**

Windings of Formex* wire, together with improved insulating materials, reduce the chances of electrical failure. Heat is dissipated quickly —motor stays young for years and years.

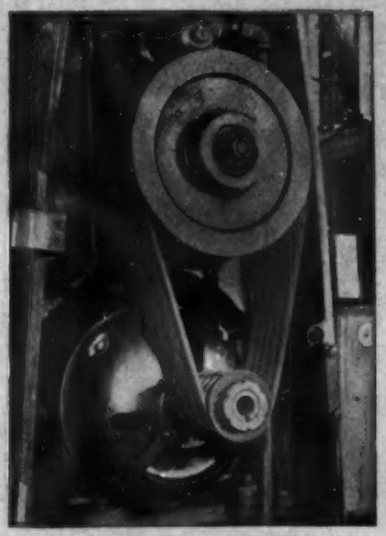
***EXTRA PROTECTION*... AGAINST OPERATING WEAR AND TEAR!**

Bearing design affords longer life, greater capacity, improved lubrication features. Bearing seals retain lubricant, keep out dirt. One-piece, cast-aluminum rotor is practically indestructible.

**Trade-mark reg. U.S. Pat. Off.*

GENERAL ELECTRIC

750-290C



5 YEARS IN "SOLITARY"

Many machine tools in the Bell Aircraft plant at Buffalo have pioneer Tri-Clad motors tucked away inside. The result is a sleek exterior for the machine and valuable floor space saved. During the war, when time was short and uninterrupted protection was of utmost importance, these motors gave dependable service, demanding only a minimum of maintenance and inspection. The Tri-Clad motor you see here driving a milling machine has not been removed for five years. It has done its job faithfully despite the strain of a 3-shift, 7-day work schedule, and along with 200 other Tri-Clad motors in the Bell plant, gives every sign of staying on the job indefinitely.

***NOW*—PEAK MOTOR TOUGHNESS**

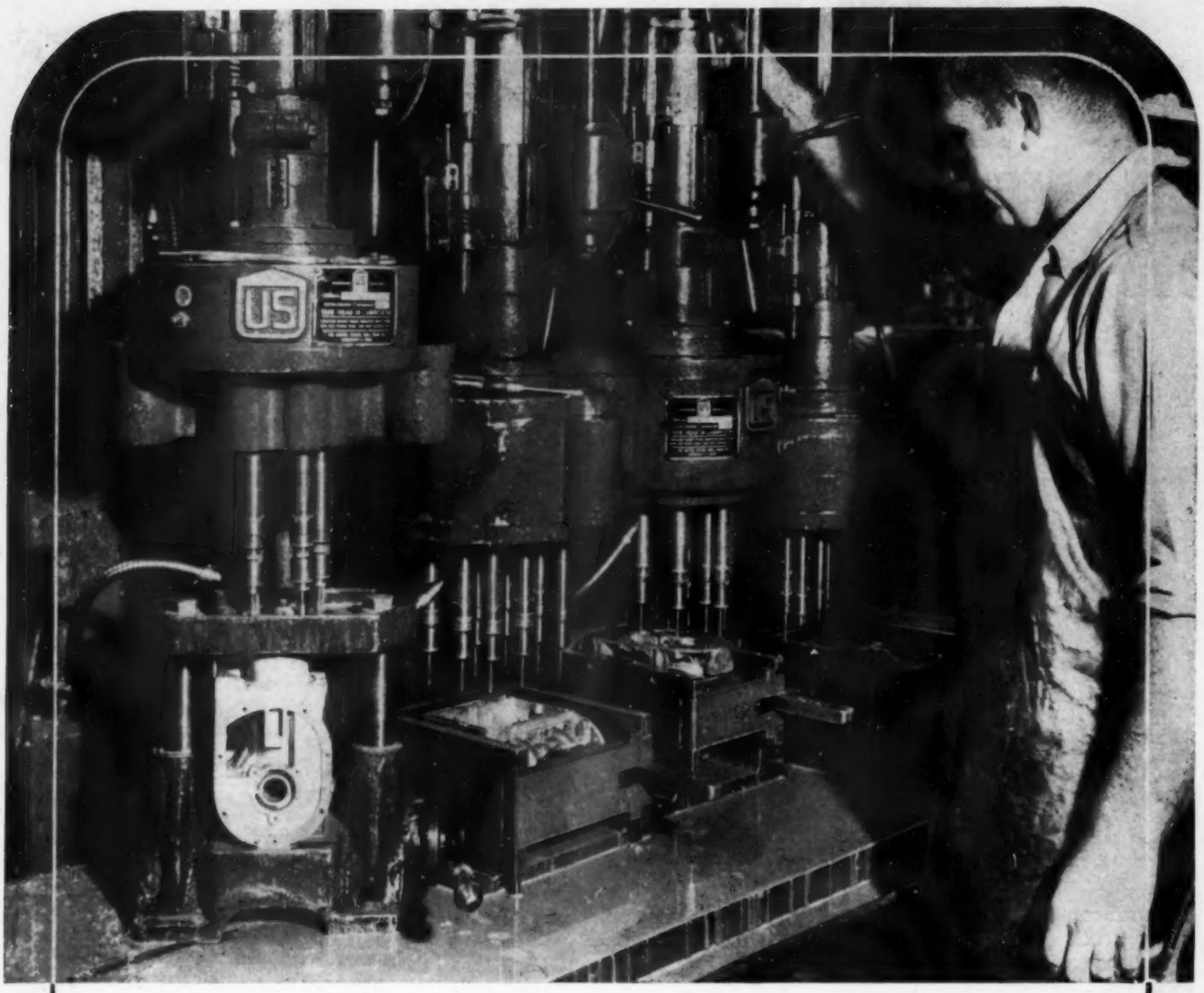
The Tri-Clad totally enclosed, fan-cooled motor is designed for use in adverse atmospheres — in iron dust, out-of-doors, in hazardous areas, and chemical atmospheres. It gives you these important construction features:

- A cast-iron, double-wall frame which completely encloses and protects windings and punchings.
- A nonshrinking compound around motor leads which protects motor interior from dust and moisture.
- A rotating labyrinth seal which further protects the motor interior from damage by foreign matter.

TRI CLAD

REG. U.S. PAT. OFF.

MOTORS



A short cut to Profit with

FOSDICK

4 SPINDLE HIGH SPEED DRILL

● The view of the Fosdick High Speed Drill shown illustrates how a manufacturer of outboard motors is taking advantage of the economy provided with the four spindle machine.

The operator taps ten ¼-inch, 20-thread holes for cylinder head—eight No. 10, 24-thread holes for exhaust port plate —ten No. 10, 24-thread holes for the bottom and water seal—and eight No. 10, 24-thread holes for intake port plates.

Each one of these groups of holes is tapped complete in one operation. With the quick operating fixtures, the operator synchronizes his work so as to keep all four spindles busy.

This is but one of hundreds of shops using Fosdick High Speed Drills as a short cut to profits on work with holes not larger than 1½" diameter.

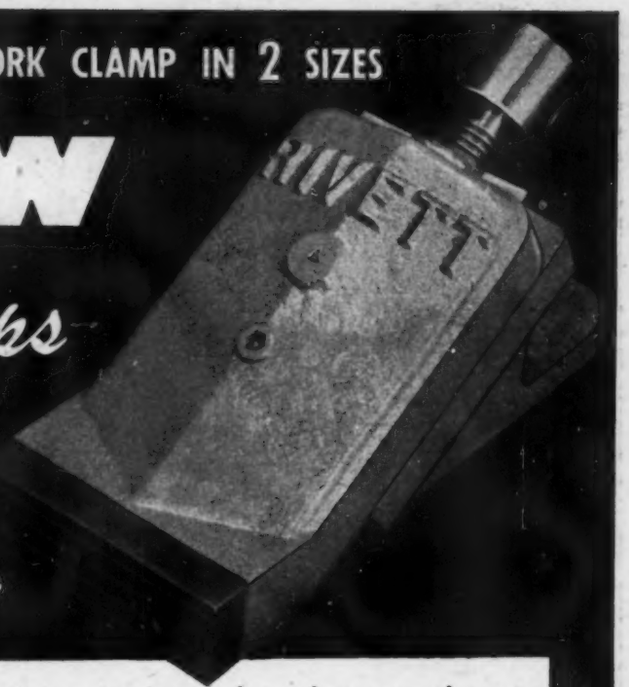
If you have work requiring drilling, reaming, counterboring or tapping within this machines capacity it will pay you to investigate Fosdick.

A Fosdick Speed Drill bulletin H.S.A. is yours for the asking. Write.

THE *Fosdick* MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

Now THAT HANDY *All Purpose* WORK CLAMP IN 2 SIZES

LOCK JAW



Stops

SHIMMYING
BUCKLING
HEAVING
SLIDING
YAWING
CHATTERING

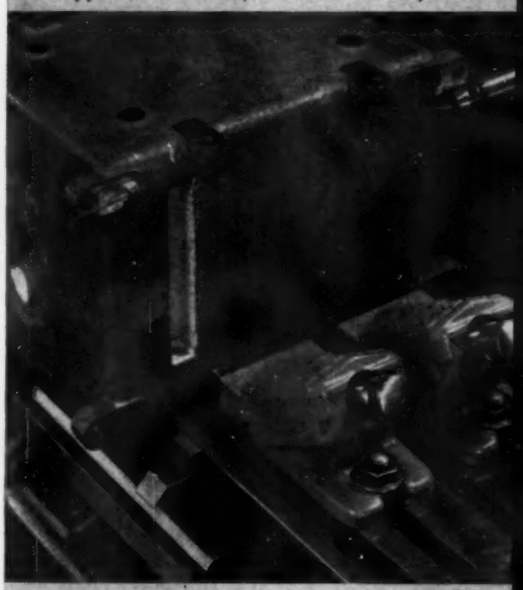
Applied as a three jaw chuck on face plate.

Eliminates expensive and cumbersome clamping and bolting operations.

Now the heavier Model B Lock Jaw for large table operations and a brand new Model A for positive clamping on smaller machines with limited table space. The new and lighter clamp has interchangeable jaw faces formed to fit contour of work.

The same positive, powerful two-way locking, sure-grip pressure downwards and sideways. Production departments and toolrooms find them handy time savers on planers, radial drills, shapers, milling machines, surface grinders, boring mills and lathes.

Write for Bulletin 140A and specifications.



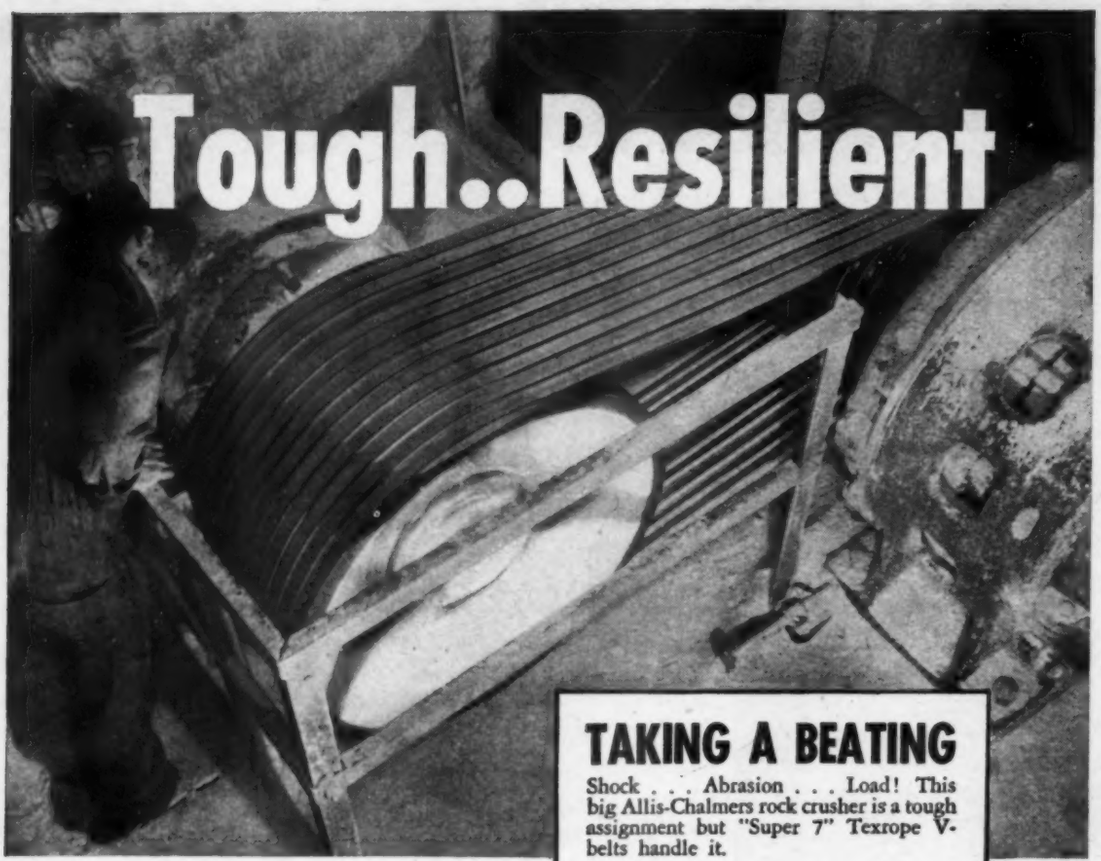
Model A on small toolroom horizontal miller.

RIVETT LATHE & GRINDER, Inc.
BRIGHTON · BOSTON · MASS · U S A

RIVETT

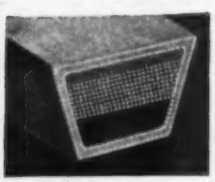
Model B Lock Jaw on horizontal boring mill.

Tough..Resilient



TAKING A BEATING

Shock . . . Abrasion . . . Load! This big Allis-Chalmers rock crusher is a tough assignment but "Super 7" Texrope V-belts handle it.



. . . You get 7 Great Features in "Super 7" Texrope V-Belts

1. TOUGHER COVER. Two layers of tightly woven long-staple cotton fabric and tough, wear-resistant rubber compound. Protects the belt carcass from grit, moisture and wear — holds its shape — assures maximum belt life.

2. SHOCK ABSORBING. "Super 7" belts combine great strength with the degree of resiliency necessary for long life and smooth power transmission.

3. HEAT RESISTING. *All* "Super 7" V-belts are designed and built to give high resistance to heat.

4. STRONGER CORDS. More cords—imbedded in cool-running rubber compound. A powerful load-carrying structure.

5. PRECISION CURED in pressure molds to assure accurate section and perfect bonding of cords, cover and cushion.

6. ACCURATELY MATCHED. Every belt weighed, measured and carefully inspected before being sized and packed.

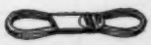
7. ENGINEERING LEADERSHIP. "Super 7" Texrope V-belts represent 22 years of research and experience — by Allis-Chalmers, originator of the Multiple V-belt drive.

"Super 7" Texrope V-belts come in five types to meet every operating requirement: *Standard — Heat Resisting — Oil Resisting — Oil Proof* and *Static Resisting*. Call your Allis-Chalmers office or dealer. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 2238

Refer to Sweet's Catalog.

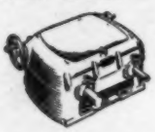
TEXROPE .. Greatest Name in V-Belt Drives



"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationary or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

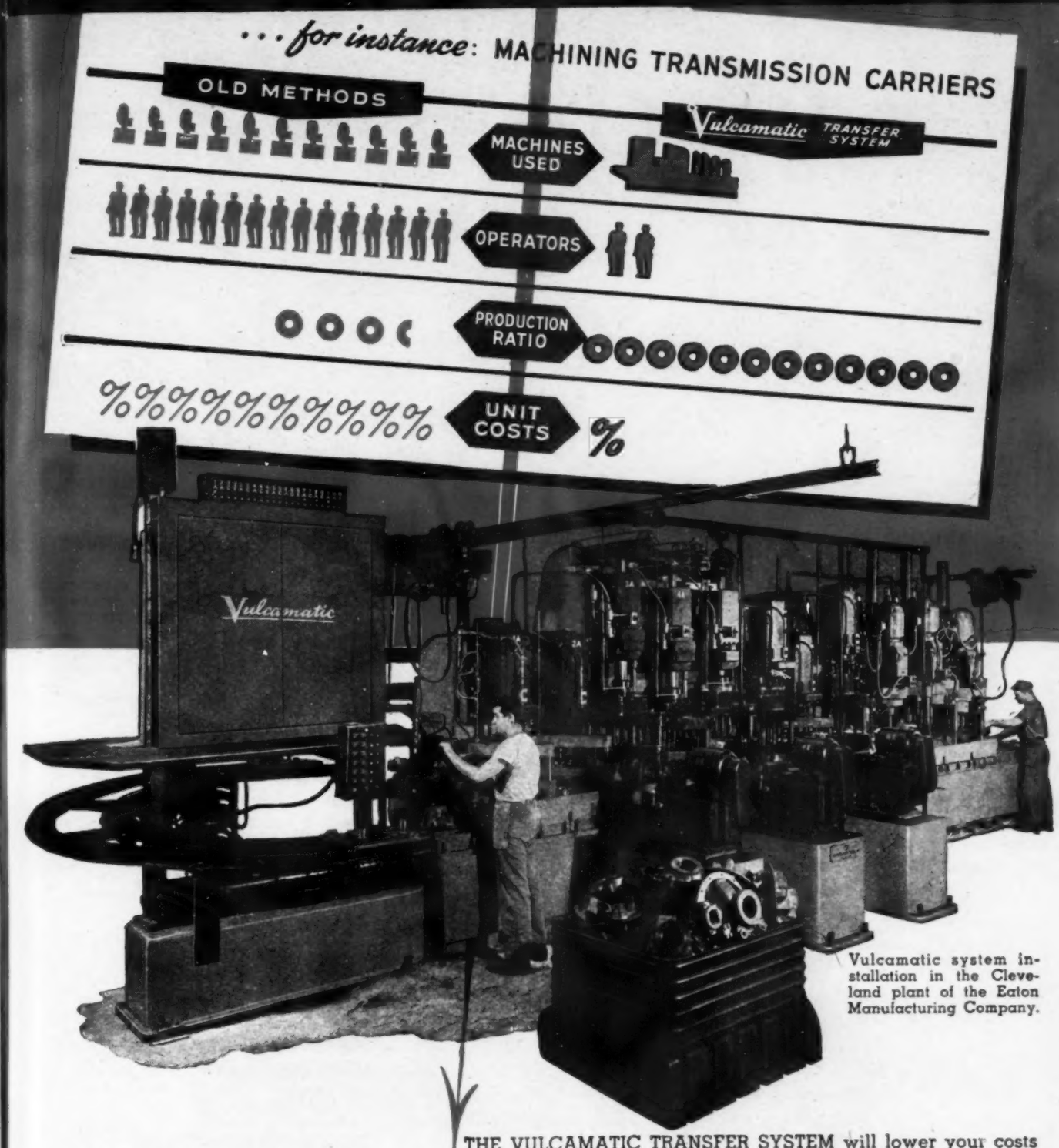
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

Vulcamatic TRANSFER SYSTEM

LOWERS COSTS • INCREASES PRODUCTION



Vulcamatic system installation in the Cleveland plant of the Eaton Manufacturing Company.

THE VULCAMATIC TRANSFER SYSTEM will lower your costs and increase your production. The VULCAMATIC System consists of a series of machine tool stations grouped together into one *automatic machine* designed to DRILL, REAM, TAP, BORE, COUNTER BORE and MILL a part in any sequence or cycle. THE VULCAMATIC SYSTEM is flexible in construction and can be quickly readjusted to meet any change of part or redesign.

THE VULCAMATIC SYSTEM WILL PAY FOR ITSELF

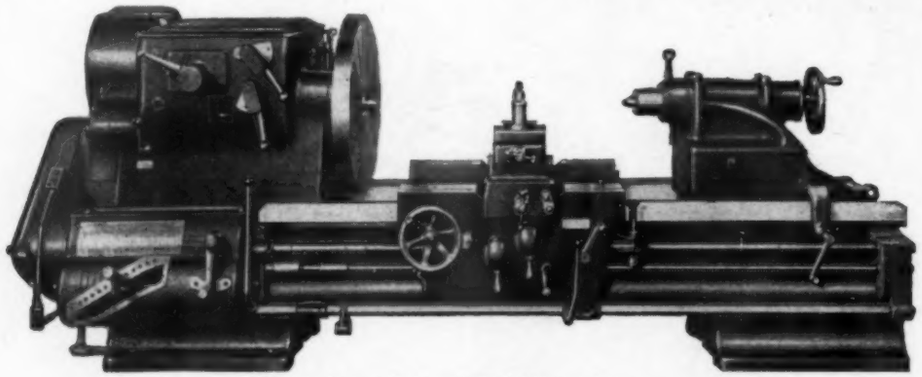
Vulcan Tool Co.
DAYTON 10 • OHIO • U.S.A.

Our application engineers, located in strategic areas, will be glad to discuss the advantages of a VULCAMATIC TRANSFER SYSTEM installation in your plant.

Massive—

Springfield 30" Medium Duty Geared Head Lathe

To handle those big jobs *and* the smaller ones choose Springfield Geared Head Lathes. Long, accurate performance is "built in" with the deep well-ribbed bed, with the nickel and chrome steel used and with the powerful massive design. Thirty-six changes of threads and feeds are available in the 30" lathe. Reverse gears are arranged to produce right- or left-hand threads without the use of wrenches and with a minimum of effort. Lead screws are tested to .001 inch to the foot and are used only for threads. A feed rod is supplied for all feeds.



When in need of a 30" lathe, write us for Bulletin 165.

THE SPRINGFIELD MACHINE TOOL COMPANY
SPRINGFIELD **OHIO, U.S.A.**

Now . . . a single line can treat your Steel, Zinc, and Aluminum Production

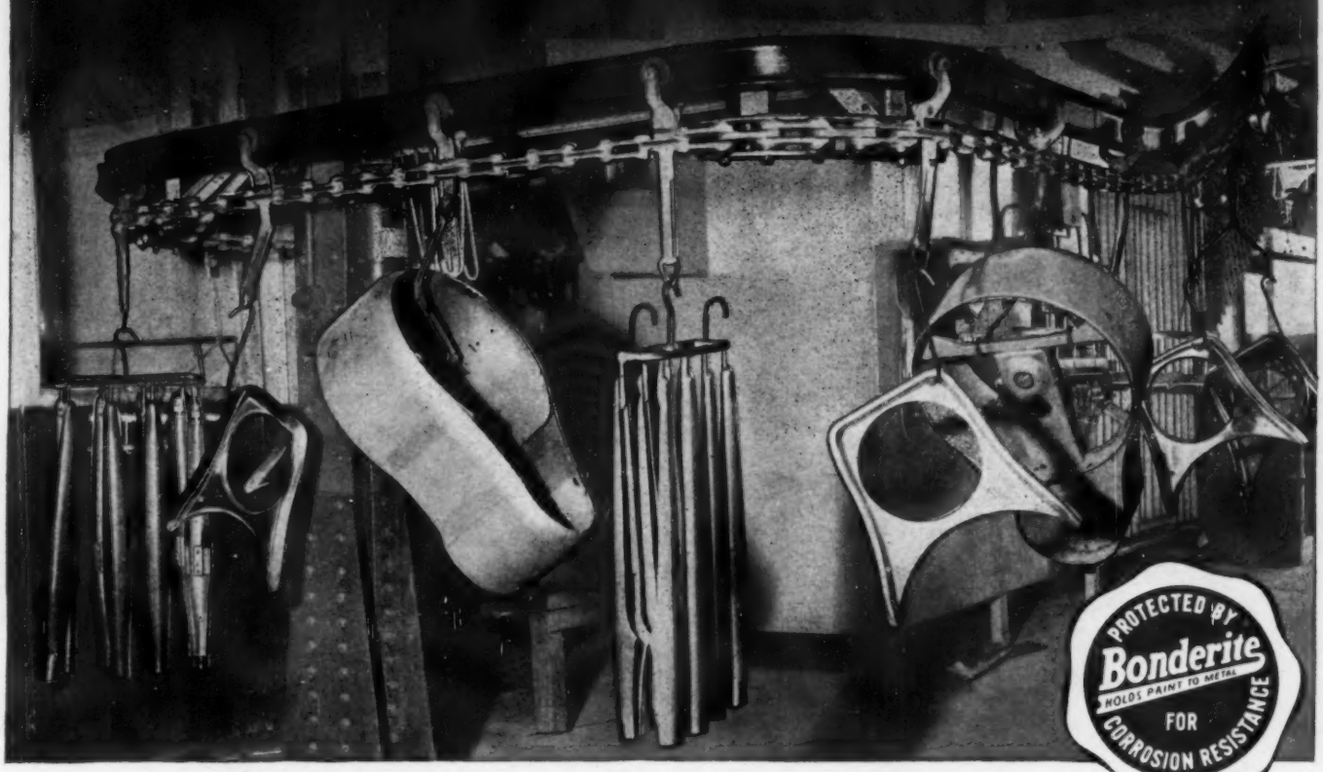


Photo courtesy Easy Washing Machine Corp.

Here's news for manufacturers whose production metals are mixed. Now you can process parts of steel, zinc, aluminum, and their alloys on the same Bonderizing line, at the same time, and get high-quality, uniform, fine finish protection for all!

On all these metals, Bonderizing creates a crystalline, nonmetallic paint base on which the finish anchors itself against peeling and flaking. Bonderizing, integral with the metals themselves, effectively retards rust and corrosion.

With Bonderizing, fine finishes look better longer.

Investigate this simple, economical, effective means of finish protection for *your* products.

Write for full information today!

PARKER RUST PROOF COMPANY, 2196 East Milwaukee Ave., Detroit 11, Michigan

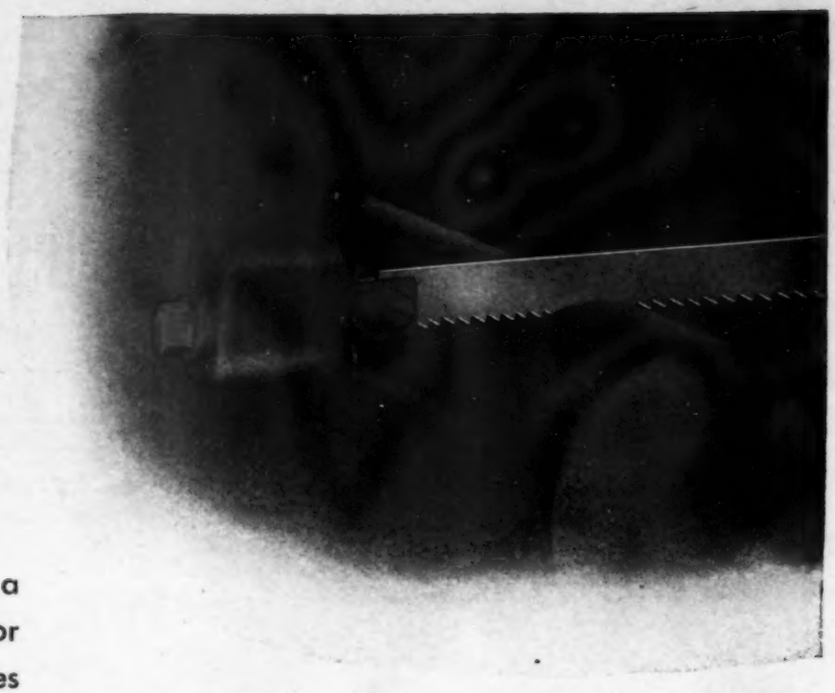
Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat Off.

BONDERIZING Holds Paint to Metal · **PARKERIZING** Inhibits Rust · **PARCO LUBRIZING** Retards Wear on Friction Surfaces

PARKER PRODUCTS CONQUER RUST

Which is better for you...

A Hack Saw, or a Band Saw?



Only MARVEL can give a strictly impartial answer for only MARVEL manufactures *both* hack sawing machines and metal cutting band sawing machines, and manufactures *both* hack saw blades and metal cutting band saw blades. For this reason, your local MARVEL Sawing Engineer is best qualified to analyze your particular metal-sawing or cutting-off problems and recommend, without bias, the type sawing machine and correct blade to do your work most efficiently.

1947 MACHINE TOOL SHOW CHICAGO SEPT 17-25

MARVEL recommendations are based on actual operational laboratory and field tests covering *cutting-off time and costs* for bars, tubes, and shapes on all types of sawing machines and with various blades. (It is significant that time factors of various so-called "fast" machines vary as much as 4 to 1 on many operations, while costs differ as much as 6 to 1.)

•

Write for new catalog C48, and if you feel that our field service engineer may be helpful to you, let us know.

•

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

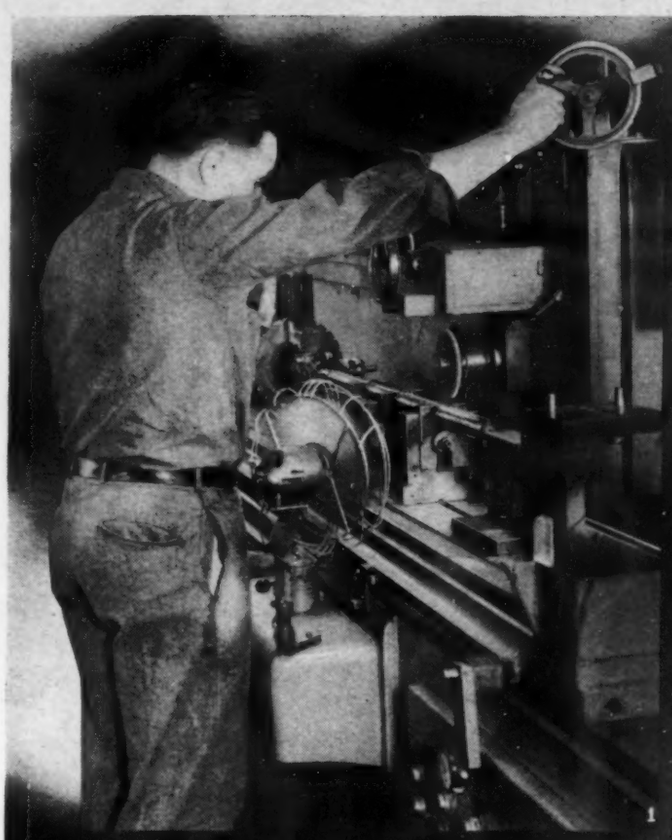
FOR BROACHES

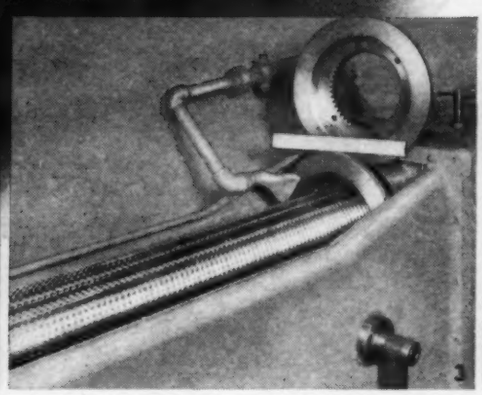
and for ALL Your Broaching Needs

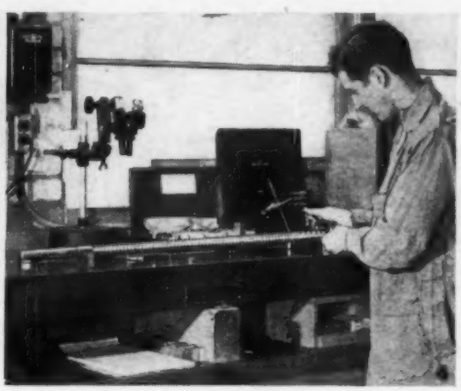
SEE *American* FIRST

You can be sure of greater satisfaction when you buy broaches from *American*. This is because of *American's* broad experience in all phases of broaching—machines, tools, fixtures, and engineering. This all around experience assures you of broaching tools that will give exceptionally long life at low initial cost.

See *American* first for all types of broaches: surface, round, spline, serration, hex, square, and formed broaches in any required size. *American* also manufactures pull and push heads for broaching tools of all sizes. And see *American* first for *everything* in broaching—machines, tools, fixtures, and engineering.







(1) Grinding a spline broach. All *American* broaches are ground by skilled broach makers to exceptionally close tolerances. (2) These four broaches, used in succession, cut 24 angular splines in steel airplane landing gear struts. Broaches are 65" long, and cut a spline section 12⅛" long by 4¼" I.D. Inset shows broached interior of part. *American* manufactures broaches of every size and variety, for the metal working industries. (3) This large broach, in a standard *American* H-30-72 Horizontal Broaching Machine, cuts 46 involute spline teeth in a bevel gear part. Size of broach is indicated by 12" rule shown with broached gear part placed on top of machine. (4) Checking a spline broach for spline width in *American's* Broach Inspection Department. Every broach must pass rigid inspection before shipment.

WRITE FOR CATALOG NO. 144

Contains complete description of different types of broaches and machines. Tells uses of each. Gives information on care and maintenance of broaches, specifications of standard broaches, and other useful facts. No obligation. Write for your copy today!

MEMBER BROACHING TOOL INSTITUTE

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

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BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

PAST PERFORMANCE

. . . a safe guide for "The Tools You Buy Again"

Actual results — in terms of better, faster, more economical work—make standardization on UNION TOOLS a logical procedure and a sound policy. Years of specialization in development and manufacture has enabled UNION to produce long-lived, dependable small tools — tools that help keep production moving at maximum speed and accuracy at a minimum of expense.

Once you've put UNION tools to work, they'll be the "Tools You Buy Again." Performance will have been the basis for your choice.

UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

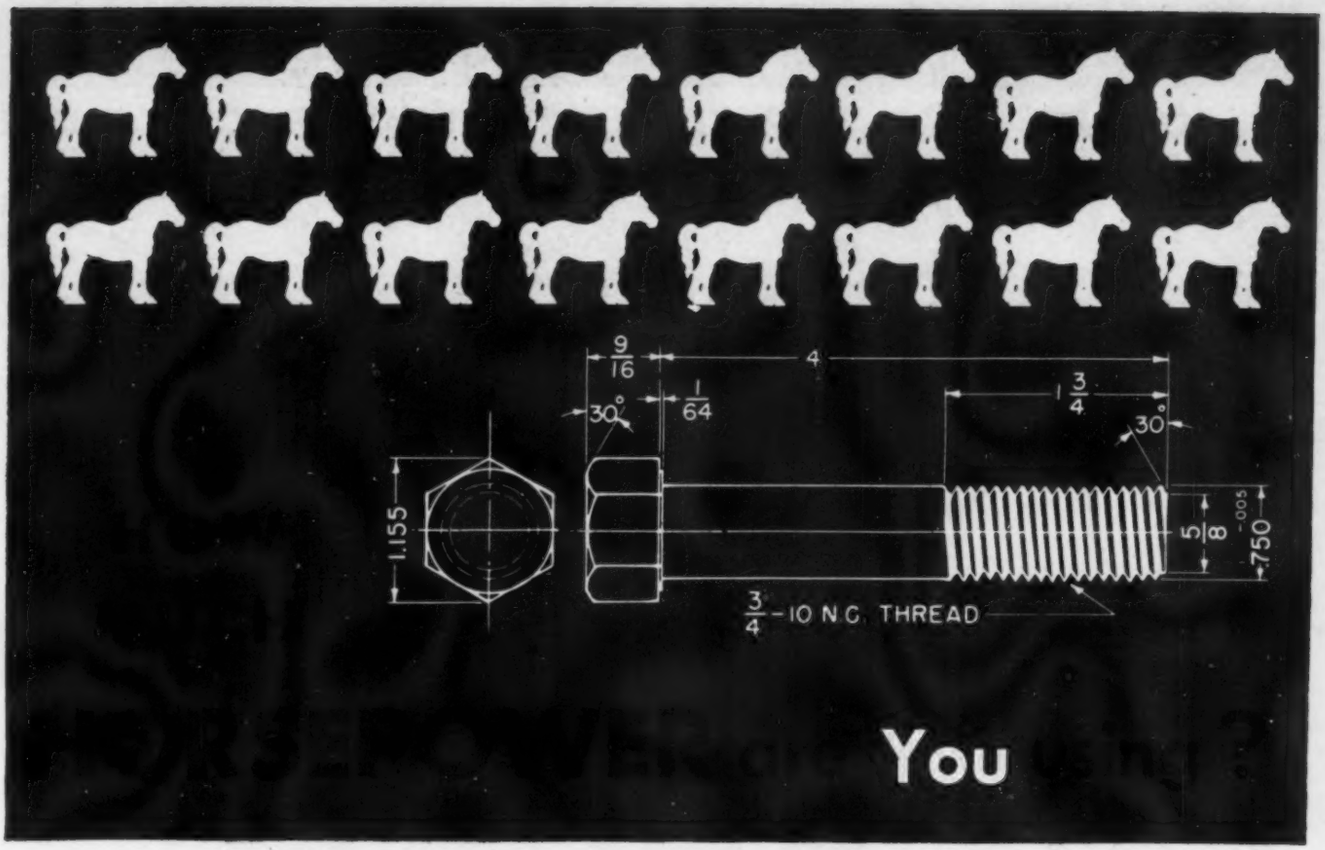
MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION



This ¾ x 4" Cap Screw is machined entirely with carbide cutting tools except for the high speed steel Chasers in the die head. *Total time per piece is one minute.*

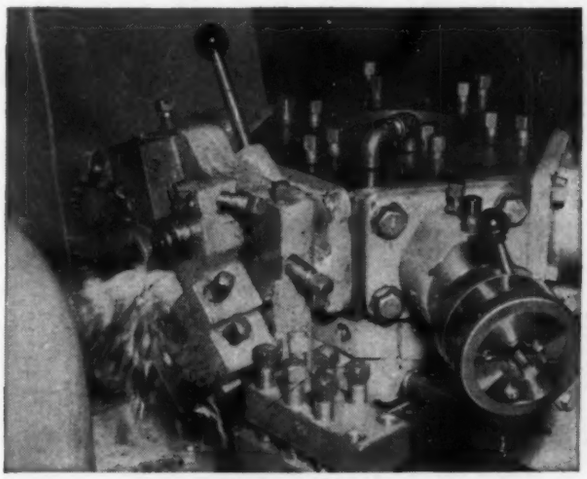
Here is a typical example of the effective use of carbide cutting tools on a Jones & Lamson No. 3 Universal Ram Type Turret Lathe. The depth of the main turning cut is less than ¼". *Yet the single carbide turning tool creates a load in excess of 16 horsepower.*

Of course, we know this simple, ordinary job would normally be routed to an automatic. But we put it on a Turret Lathe to give you, *a practical, simple example of the horsepower required for effective turning with Carbide tools.*

Our folder "One a Minute" describes this operation in detail, and contains vital information for anyone contemplating the purchase of a Turret Lathe, the general use of carbide cutting tools, and greater efficiency in metal turning.

Send for this folder. Or better yet, telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.

Jones & Lamson Lathes are designed specifically for the most efficient use of carbide cutting tools.



Spindle speed 1500 RPM Feed .033

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Turret Lathes* and Fay Automatic Lathes
Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

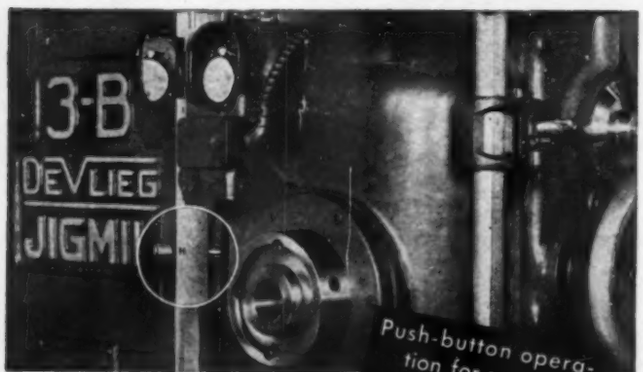
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL *by* DEVLIEG

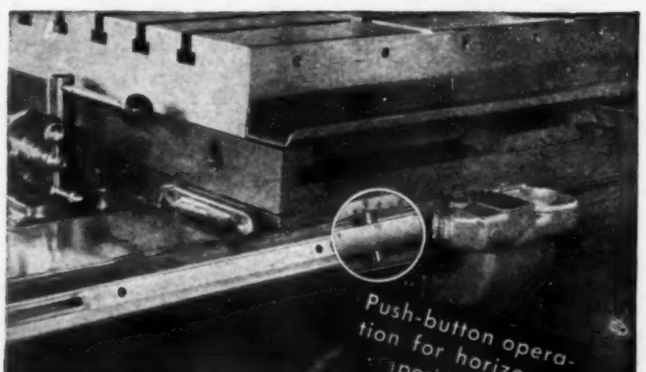
The finest known process for accurately spacing and machining holes.

THIS IS HOW IT WORKS . . .

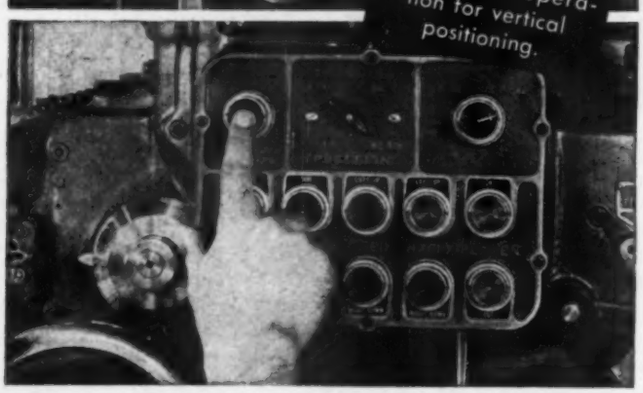
Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.

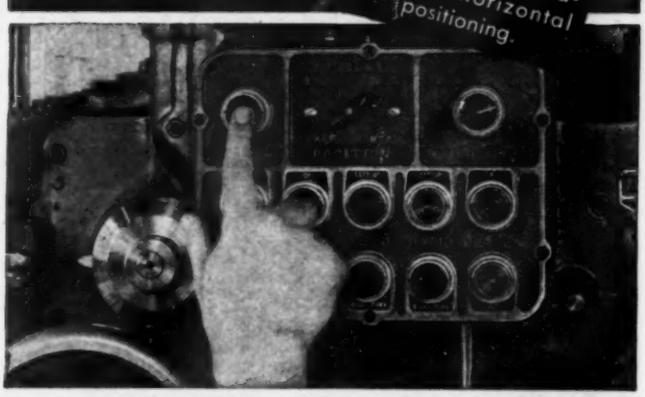


Push-button operation for vertical positioning.



Push-button operation for horizontal positioning.





DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Bunting is equipped to produce special Cast Bronze Bearings in any quantity from a single bearing to a million a month of a single size.

Bunting ability to deliver is traditional—whether the quantity be one or a million. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

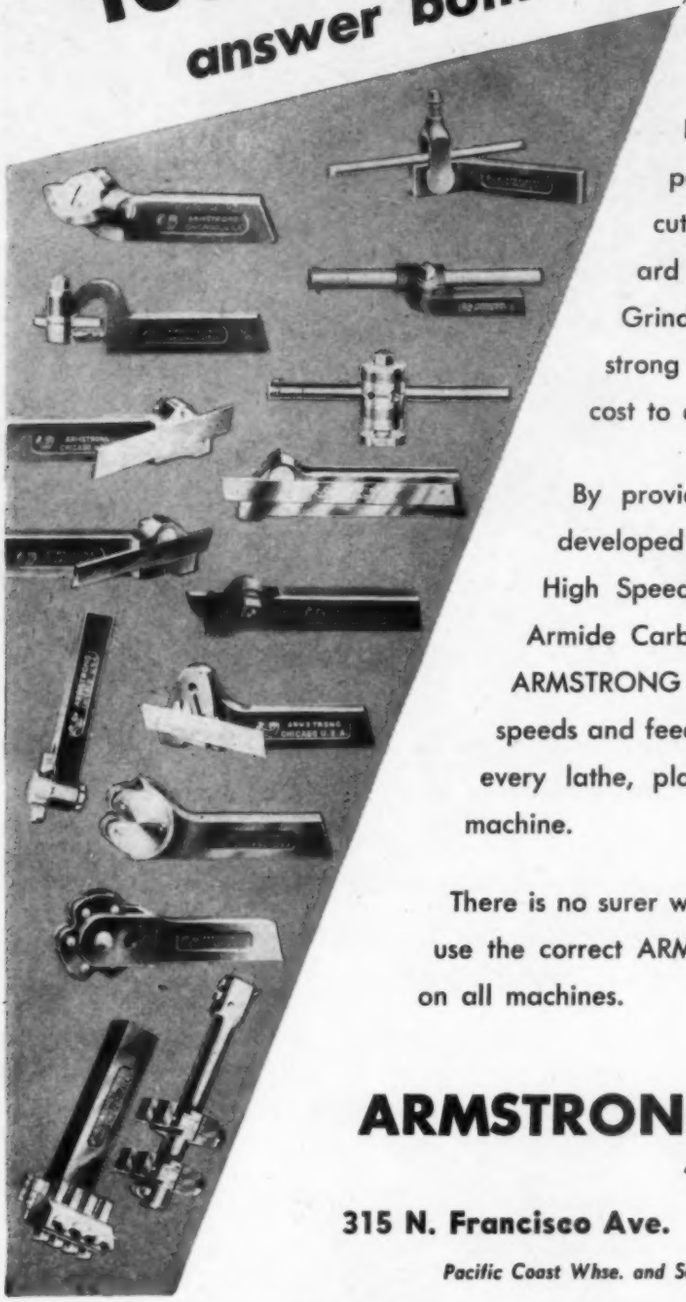
Bunting

BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

56

ARMSTRONG TOOL HOLDERS answer both. . .

1. The problem of lowering costs
2. The problem of increasing output



By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

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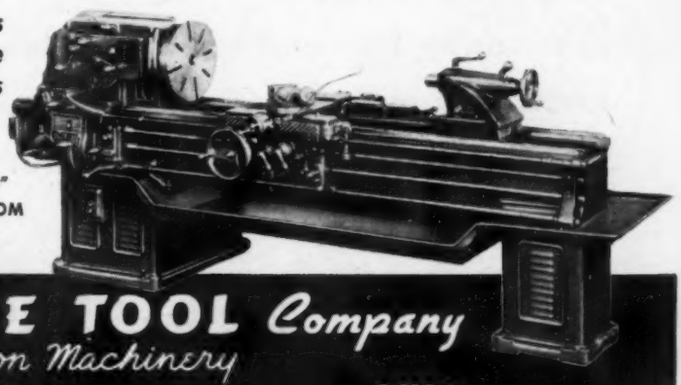

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The Sidney 32" x 60" Heavy Duty Engine Lathe.

Illustrations courtesy of The Sidney Machine Tool Co.

MACHINE TOOL SHOW
Chicago, Sept. 17-26
Booths Nos. 514-517

The above statements from The Sidney Machine Tool Co. indicate the performance they are receiving from Bickford Radial Drills—a performance which is dependable, economical and accurate.

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American Machinist's Spot NEWS OF METALWORKING

Local unions of International Association of Machinists have been advised to abstain from striking unless they are sure of their position under the Taft-Hartley law and only after having consulted international officers. This decision was reached at first special session of IAM's executive committee called in more than a decade. Intent is to guard against possible damage suits.

One out-of-state machinery builder has paid State of Indiana $20,000 taxes on $2 million installation. If machines had been only shipped into state, the tax would not have applied. But Indiana contractor was hired to put in cement foundations. His participation as subcontractor qualified entire job for 1% tax.

Studebaker is reported planning to convert aircraft engine plant which it operated during war into an automobile axle plant. Both front and rear axles will be produced.

Production of 165-ton E-3-type excavators for use in open pit mines has begun at Ural heavy machine building plant in Sverdlovsk. Underframe and turning platform of excavator are welded. To start the machine, operator turns control handle. Work then is done automatically by series of electric devices. Electric equipment weighs 20 tons. Ten 40-ton dump cars can be loaded in 30 min.

Building construction trends: materials prices may be down 10% by end of year, but no change expected in hourly wage rates. Productivity is not good. Example: on one important job, men are laying 512 bricks a day, but should lay twice that number. Better flow of materials should help keep down costs.

> **Instead of doling out dollars prodigally, Marshall Plan is said to envisage establishment of funds in U. S. for each country affected, after which interested government agencies will decide how much of what is to be exported to that country. Under such program, machine tool orders eventually may be placed from a central pool set up to facilitate delivery of badly needed equipment.**

Italian government has been forcing metalworking companies to put far more workers on payrolls than operations justify, paying extra help full week's wages. This practice, plus high social security taxes, runs up labor costs to 80-90 cents per hr., tends to eliminate competitive price advantages.

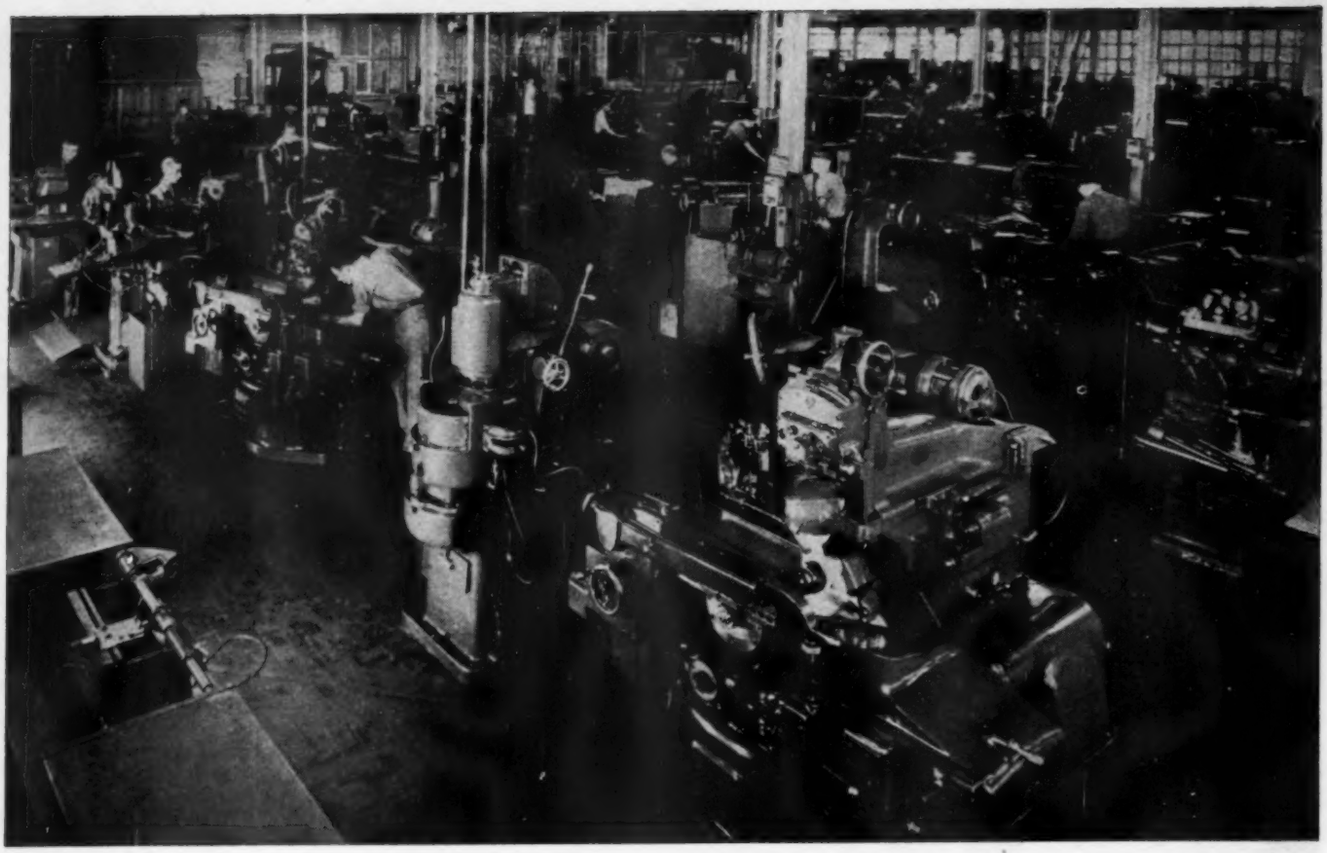
V-type engines to be used by two General Motors divisions will have 25 deg. between planes of the two banks of cylinders, instead of 90 deg. Many different types of machine tools will be needed to produce them. A small-angle V-type engine with six cylinders is on test.

Special "family allowance" for all salaried employees with base salary of less than $300 a month has been granted by Aeroquip Corp., Jackson, Mich. Allowance of $10 a month is made for wife or fully dependent husband and of $5 a month for each dependent child under 18. Maximum allowance is $25 a month. Applied to employees with six-months' service, policy stimulates ex-G.I.'s to gain experience in lower levels for subsequent promotion and upgrading, and encourages younger employees to marry.

Civilian employment in U. S. passed 60 million in June for first time in history. It was 60,055,000, or 1,730,000 more than in May and 3,700,000 over June, 1946.

Sharp increase in plant elections is expected under Taft-Hartley law. If NLRB is to handle these elections properly, it will need greatly enlarged funds and much bigger staff. There were 5100 cases before the board when new law became effective. Though majority will be settled privately, some action probably will be necessary in 500-1000. While unions intend, in some cases, to by-pass the board, it will be impossible for them to avoid appearances in the capacity of defendants.

Canadian Car & Foundry, Montreal, will build 2200 railcars costing almost $10 million for South African Railways and Harbors Administration. Delivery will begin next year.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Look To Your Foremen!

Management is not required under the new labor law to deal with a union comprised of supervisors.

The law, to be specific, goes even further. It excludes supervisors from the bargaining unit.

This provision should be a source of satisfaction to manufacturers who have contended that foremen are a part of management rather than a group lined up on the other side of the bargaining table.

But such satisfaction will be short-lived unless employers practice what they preach.

Legal restraints upon organizational procedure do not in themselves make loyal foremen. In fact, if just reason for dissatisfaction exists and is allowed to fester without resort to union action, as now forbidden by law, conditions could easily become worse than before the new law's passage.

The point is that management must earn the loyalty of its supervisors. It must see that they get the perquisites, in authority and income, commensurate with their positions.

Management has not been without fault in the rise of unionism among supervisors. It is subject to indictment on several scores.

In too many instances, it gave a paltry preference in pay to foremen compared with the men under them.

In too many instances, during the war, men in the shop earned considerably more, by means of long hours, overtime and increased hourly rates, than their foremen, who had far more responsibility.

In too many instances, management has bypassed foremen in handling grievances with unions, openly proving to the rank and file that their immediate superiors possessed no real authority.

In too many instances, top company executives have neglected to inform foremen of new developments. The foremen have learned the news from their own departmental people. How easy it would have been to tell the foremen first and give them the feeling that they occupied a preferred rating!

By the nature of what it denies to supervisors in unionization, the new law imposes upon industry a new and added responsibility to see that foremen are accorded the income, the authority, and the feeling that they are part and parcel of management.

The mere will to fulfill these responsibilities will not be enough. The job of seeing that they are carried out should not be delegated to underlings.

It is a task for top management, and for no one else!

Burnham Finney

EDITOR

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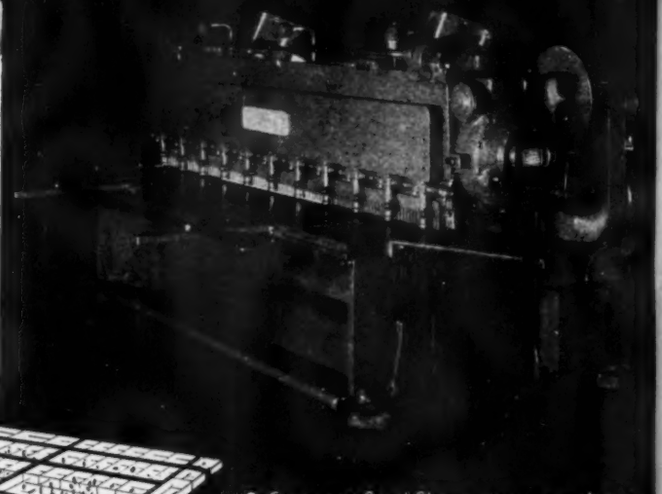

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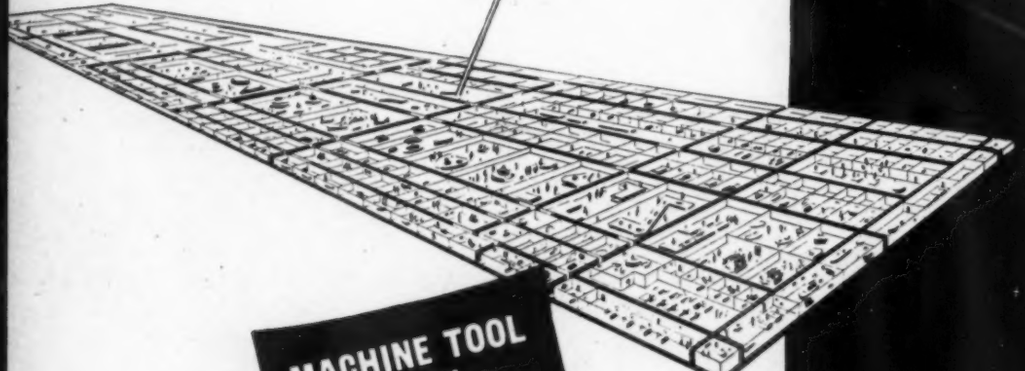

MACHINE TOOL SHOW
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Show Preview . . . Act I

BY E. J. TANGERMAN
MANAGING EDITOR

Being a resumé of major developments in machining and machine tools promised at next month's Machine Tool Show in Chicago

TREMENDOUSLY increased feeds and speeds, automatic control, including handling and clamping, and combinations of units or entire machines are major developments in machine tools to be shown at the forthcoming Machine Tool Show, according to information collected by the editors of *American Machinist*.

General Developments

TOOLING ALSO IMPROVED Less-brittle cemented carbides, solid carbide bits supported so cuts are made by the bit end rather than its side, better profile grinding of carbide tips, older cutting materials with improved heat-treatment and "cushioned" support, flycutters for soft materials, "friction" bandsawing, high-cycle and air-turbine grinding heads, more versatile dieheads, automatic electronic sorting gages, improved clamping and handling devices, and a host of other tooling developments will also be shown.

NON-CUTTING TIME CUT Feeds have been increased by providing hydraulic devices or variable-speed motors to permit exact feed selection. Non-cutting time is reduced by providing rapid traverse for approach and return, even for short distances. Automatic cycling, readily adjustable by the operator, handles rapid traverse without danger.

CONTROLS GROUPED, DUPLICATED Manual and pushbutton controls have been grouped and even duplicated on opposite sides of machines for ease of control. Electric controls are flush-mounted as if they were designed in—not added on. Electronic and motor-generator rectifier units have been built to rectify usual alternating current to direct current for speed variations, dynamic braking and "inching." Increase in the number of motors per machine makes it possible to control each function independently. Electronic and hydraulic units have been combined more effectively—each being used to best advantage.

AUTOMATIC CYCLING To provide special machine advantages for limited production without excessive setup or investment, several methods are used. One is the tool that can be operated either manually or automatically, the change-over being made in seconds. Some of these units set the automatic cycle as the operator handles the first cycle manually.

LATHES, HONES UNITIZED A definite trend is to combine self-contained milling, drilling, tapping and other heads on a special base. In one case of this sort, lathe heads and toolslides are each separately motored, self-contained units connected in desired numbers to the machine base only by a flexible conduit. The slide has its own change gears with micrometer stops to control feed and rapid return. In another case, a honing machine is broken into units which can be mounted on any type of column or base, thus reducing reciprocated weight and speeding operation. Head and guide bars are unnecessary. Elements are a lighter head incorporating a quill spindle, a hydraulic unit, and an electrical control unit. Still another method is special tooling on standard machines.

MAINTENANCE SIMPLIFIED To reduce downtime for maintenance, electric controls are concentrated on door panels or just inside, hydraulic lines and units made accessible, motors provided with quick-removable mountings and set near adequate doors. Controls themselves are refined and simplified, being built as a flush, integral part of the machine instead of as apparently "hitched-on" gadgets. Hydraulic pumps with electronic control of feed, return and neutral cycle obviate many pilot-operated parts. To avoid the

need for repair from accident, interlocks are provided in circuits requiring certain pressures, temperatures or potentials. In one case, for example, an air interlock system prevents indexing of a center-column way machine while any spindle is working, starts all heads after indexing is completed.

SPECIAL FEEDS, WORKHOLDING To reduce machine down time, some units now have interchangeable tool heads so one can be used while tools in the other are reground. Alternate-feeding or rotary tables permit loading of one part while another is, or several others are, being machined. Quick-acting clamps and chucks are faster and surer than manual workholding. Magazine and hopper feeds, special ejection devices or conveyors and chip conveyors appear more and more frequently on production machines.

MULTIPLE SPINDLES, STATIONS Multiple operation, the application of several tools to the piece at once, has been extended. Multiple cuts are now applied to grinding, gear-cutting, and broaching. Further, the familiar multiple-spindle machine is now supplemented by the multiple-station machine, really a series of machine tools set up in a line or a loop and joined by automatic transfer devices and interlocked controls. A recent installation has 24 stations. Dozens of others are going into auto plants to cut labor cost per piece.

HIGHER PRECISION DEMANDED War demands for tolerances of tenths and hundredths of thousands of an inch forced many shops to learn precision techniques. These shops learned that parts to such tolerances could be assembled more easily and ran more smoothly, so are applying similar tolerances in peacetime products. They also learned that over-all cost of working to tenths is less in quantity production, for these and related reasons. This means machines with greater rigidity, better bearings and bearing susrfaces, improved lubrication, plus atmosphere control.

DESIGNS STRESS SPEED, WEAR Hardened and ground ways on beds, tables, saddles; hardened and thread-ground feed and drive screws, automatic lubrication, variable-speed drives, dial indicators for speed, load, feed, more extensive use of anti-friction bearings—these are typical design changes.

AUTOMATIC SIZING, TRACING Accuracy requirements have also stimulated application of built-in automatic sizing devices, pneumatic, electric and hydraulic as well as mechanical. Micrometer adjustments for tool settings are being provided also. Hydraulic tracers have been applied to lathes and millers, electronic feed and duplicators on millers. Interesting and unusual are efforts to control close-tolerance internal grinding with automatic air gaging, to signal audibly from the duplicator stylus, even to project complex contours by light onto pieces during inspection, layout or machining. One new duplicating attachment varies a magnetic field as it moves over the templet, has an electronic unit less than 1 cu. ft. in size. First applied to vertical millers, it will be made also for other machine tools.

So much for trends in general. Here are effects, process by process:

Turning & Boring

AUTOMATIC CYCLING LATHE A turret-lathe attachment will automatically duplicate any job within machine capacity. The first piece is machined manually, the automatic control being locked for each tool setting, and the machine is set for automatic cycling. However, the operator may interrupt at any instant to vary a dimension or even to machine a different piece. When he finishes, he can switch back to automatic control without effect. Micrometer adjustments on feed dials and stops allow compensation for tool wear without resetting the machine. Such a machine is set easily and is more accurate than a manually controlled one, thus can handle lots of as few as ten pieces economically.

SHAFT DUPLICATION A new shaft-duplicating lathe can work from a prototype for lighter pieces or a sheet-metal templet for heavier ones. A single hydraulic system controls action of the pilot-operated single-point tool, carried on a tool slide at 45° to the work axis so square shoulders, radii or bevels can be turned. The toolpost may be rotated to present roughing and finishing tools to the work in turn, so finishes can be obtained that obviate grinding in some cases. Diameters to 8 in. can be turned, with reduced setup time and measurement of only the first diameter.

BECOMES SEMI-AUTOMATIC One engine lathe, with the throw of a lever, becomes a semi-automatic unit for first- and second-operation work on gear blanks, straight and flanger bushings, and various shafts. The front carriage has a cycle including power-driven longitudinal feeds toward the headstock and rapid return. A rear carriage for facing and necking is separately motored and cycled. Spindle speed of 3000 rpm. is possible with "mist" headstock lubrication.

SEPARATE TOOLSLIDES A turning, facing and boring machine has conventional lathe base and headstock, but a flat bed with T-slots. On these slots, one to three motor-driven toolslides may be set, each mounted on a swiveling base to permit machining from any angle. Each toolslide rapid-traverses at 100 ipm. until the working portion of its 4-in. stroke is reached, then can be set to dwell a desired number of seconds or rapid return. Feed can be ½ to 14 ipm. by change gears. Adjustable micrometer stops control feed and traverse elements of the cycle. A flexible cable provides the only connection with the base,

so one preset slide can be retimed with reference to another without disturbing settings. Other forms of this same machine have separate headstocks as well.

LOW-LEVEL CHUCKER One automatic chucker is heavy but compact, with spindle center at elbow level, and plenty of loading clearance with slides withdrawn. The pneumatic chuck is pedal-controlled. Two main slides, longitudinal and crossfeed, are cam-controlled. Telescoping chip guards below the chuck pass chips, dirt and coolant quickly to the pan, served by chip conveyor.

QUICK-SETUP SCREW MACHINE A high-production automatic screw machine is designed to handle quantities of 25 or more pieces with quick setups. It has a power-feed ram turret, hand-operated cutoff slide, preselected spindle speeds of 50 to 5,000 rpm., feeds from 0.0005 to 0.016 in. per spindle revolution. Drive is by dc. motor, and a motor-generator set and electrical cycling control are incorporated. Another screw machine has individual dial "tuning" of turret feeds.

IMPROVED CHUCKS, TOO To take brawn out of chucking, one collet chuck has an electric booster, another a built-in electric chuck wrench beneath which jaw screws index on stopping. To obtain slow starts and stops, chuck rotation in some cases has been made a harmonic motion.

QUADRANTS GUIDE AUTOMATIC A 5-spindle automatic has quadrant sliding adjustments to replace conventional cams, hence handles production lots too large for the turret lathe, too small for the usual automatic. Cross-slide strokes are also controlled by adjustable linkages. A center and two independent longitudinal slides, four cross-slides and a separate cut-off slide provide tooling flexibility. Cross-slides have separate micrometer adjustment. Like others, the unit has a chip conveyor.

Planing

CONTROLS GROUPED, SPEEDS INCREASED To achieve the higher speeds and ease of control obtainable with other machine tools has demanded special work on planers. Dynamic braking has been applied to stop the table, and special forms of drive (such as variable-voltage motors) to provide quick reverse and a wide range of speeds. Controls for heads, table and crossrail are now centralized. Some types include table-speed (fpm.) indicators in pendants. Automatic feed is tied in with table movement. Shockless pneumatic tool lifters avoid nicking on return. Hypoid gearing permits the driving motor to be set at an acute angle to table travel and flexible couplings reduce the shaft bearings required and former troubles with alignment.

LUBRICATION PROBLEMS SOLVED Way lubrication has been a problem, because pressure lubrication merely lifts the table and usual oil will not flow freely at much more than 200 fpm. Return speeds up to 400 fpm. have been attained, however, by connecting the ends of the way and channels with a pipe loop. Oil is thus collected at the rear and forced to the front, pressure rising with the speed. To overcome temperature rise from way friction, with consequent table bowing, laminated plastics are being applied for way surfacing.

TABLE STOPS PROVIDED To avoid a smashup if the loaded table runs off the bull gear, various forms of safety stops have been developed. One is a pair of broad cutting edges which absorb kinetic energy of the table by cutting 1/16-in. chips from the table hold-down until the table stops. Another is a hydraulic jack struck by a projecting block under the table. This jack may also be used to return the table to the gear by jacking. Another device is a rack section which is mated with the bull gear, then fed against the table until a dog locks it in a slot—the section then forming an extension of the table rack.

Drilling & Tapping

AUTOCYCLING VERSATILITY Automatic cycling will be provided on one drillpress by an electric feed, a self-contained device claimed capable of doing anything more-familiar hydraulic equipment can do. One portable horizontal drilling and tapping machine incorporates headstock indexing up to 45° from the horizontal, thus increases versatility.

BALANCING WITH DRILLS Drills in combination with electronic balancing machines have been developed to balance everything from a tiny gyro rotor to an auto crankshaft. One for balancing 6-throw auto crankshafts has electrically interconnected balancing unit and 6-spindle drill. The balancing unit measures unbalance at each of six points and sets stops on each drill, then the piece is shifted on a dolly to the drill, where the holes are drilled within 0.003 in. Total time per shaft is about 2 min.

100-POSITION SPACING TABLE Precision drilling without jigs is possible with a spacing table which traverses hydraulically from one preset position to another. If equipped with 10 hydraulic cylinders for longitudinal and 10 for transverse movement, 100 positions can be preset by screw adjustments on the cylinders.

MULTI-OPERATION MACHINES GROW Multiple drilling, reaming, counterboring, spotfacing and tapping—even milling—may also be done on rotary-table machines in which the table is indexed to come successively under a series of spindles. Another variation is the horizontal

drum indexing machine, one used on rocket end plates having 34 spindles and hydraulic drive. Multiple-station machines, described earlier, are really large multiple drills, the normal heads being replaced by separate machine tools with their controls electrically interlocked. As in the rotary-table machines, indexing must be completed, clamping finished and the cycle gone through at each station—or the interlock system shuts the machine down, showing the trouble at the same time on a panelboard.

MULTI-DIRECTION MULTIPLE DRILLING Multiple drilling is now the rule. One form of machine has heads feeding from required directions to the piece held in a fixed position. An example is a tractor crankcase, in which 98 holes are drilled with multiple heads working from three directions. Another example is an automatic-indexing machine that performs 12 operations on 3 faces of the piece, 4 heads working vertically and 8 radially on the 12 chucks. The latter are rotated 180° at each indexing to present the opposite face of the work. Tool guide bushings are piloted on each fixture in turn for accuracy. Control is all-electric, indexing automatic except during setup or for "inching."

RADIAL DRILLS REFINED One radial-drill design, new in the U. S. but familiar in Europe, has a fixed arm rotating around a solid round stump and a table which revolves around the stump and moves vertically. Another incorporates automatic oiling and cleaning of the column each time the arm sleeve is moved, further to guard against scoring. Another has interlocks between feed and head clamp and between feed and column locks, with electronic feed. The same unit provides automatic disengagement for tools from the spindle nose.

Broaching

WAR SPEEDED ACCEPTANCE Irregular-shaped war-item parts, new materials and designs of tools combined to bring broaching into greater prominence during the war. It is now possible to surface-broach parts to a finish that rarely requires additional finishing, handling in one pass surfaces that formerly required a dozen machining operations.

CIRCULAR BROACHING A war-developed variation was circular broaching, in which graduated teeth on the periphery of a disk do the cutting. Such complicated sections as circular T-slots are machined in this way.

INTERNAL BROACHING Internal broaching, the first applications of which simplified forming of keyways, inside squares and polygons, ratchet teeth and odd contours, was adapted to rifling guns to give better surfaces than single-point tools in a fraction of the time. Rifles and small field guns were rifled with a series of long broaches, pulled through in turn. Larger guns were broached with a series of as many as 30 flat disk cutters pushed through singly. On high-production jobs such as machine guns, automatic loading fixtures were used.

50-TON UNITS MULTI-FIXTURED Broaching machines with capacities up to 50 tons are now available, some with single rams, but an increasing number with two, so one fixture can be loaded while the other is in cutting position. This also permits two broaching operations on the same part in the same machine—or more operations if each ram is multiple-tooled.

FASTER, SAFER PROCESSING Special horizontal broaches were applied to surfacing auto cylinder blocks before the war, providing ease of chip disposal and requiring little overhead room. Now, however, vertical machines of like size and capacity have been worked out. Larger machines of either type incorporate chip-disposal equipment. Quick-operating clamping fixtures and special tooling have made the process adaptable to relatively small lots of parts and on flat and cylindrical as well as the original irregular work. New broaches are in general faster, have new safety devices.

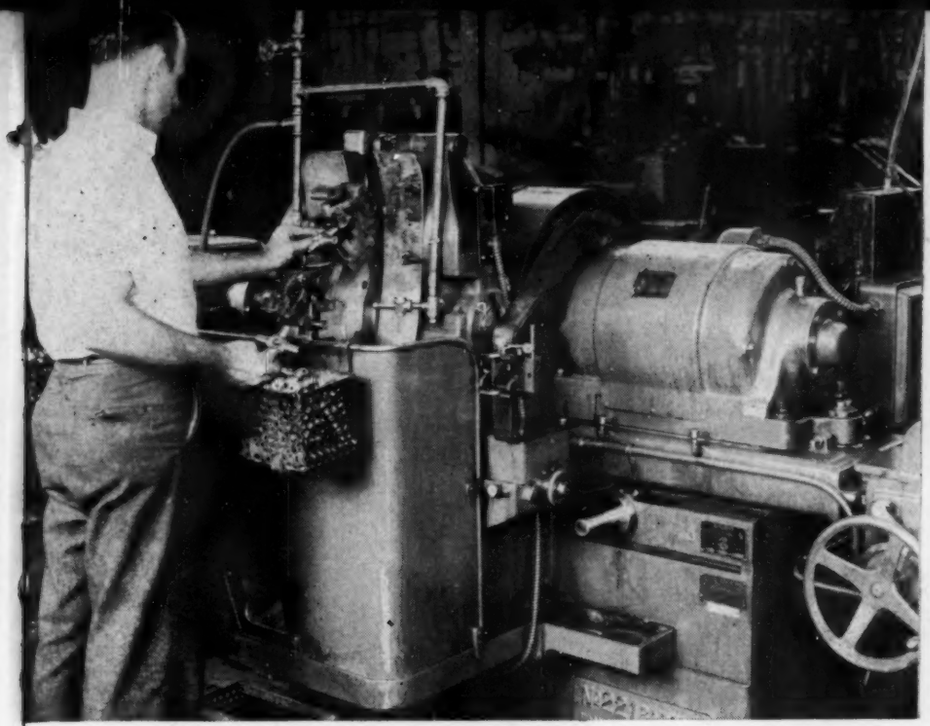
Boring Mills

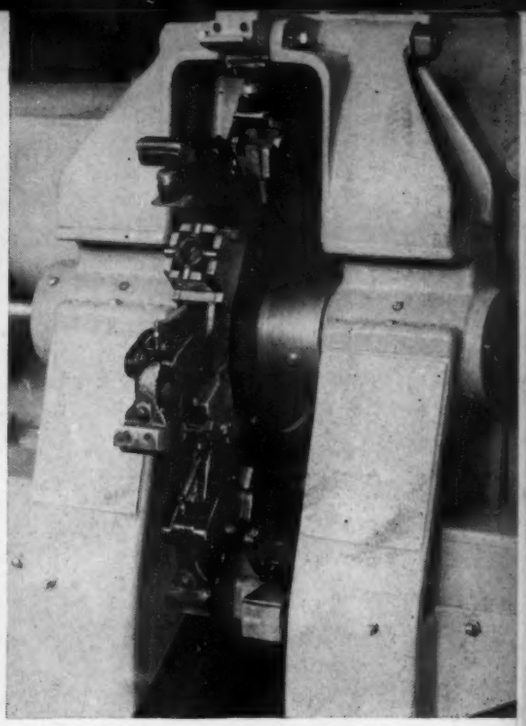
TOOLS MOVE, WORK STANDS Another machine for car wheels replaces traditional work rotation with tool rotation. Work is brought in and taken out by a special carrier and the table is a 2-position unit so one wheel can be chucked while another is in process. One large boring mill now has a large anti-friction bearing for the table track, others have plastic outboard bearings.

SPECIAL UNIT CUTS CARWHEELS Boring mills are being adapted to special-purpose jobs. One for producing railway-car wheels from 33 to 40½ in. in dia., combines a boring and facing head, a rim-turning head, and two side heads, all automatically cycled and with their own feed motors. The 100-hp. main drive motor provides a table speed of 5 to 25 rpm. Both side heads incorporate taper attachments to generate the tread and flange. Accuracy and finish are improved and production multiplied by six or more. Wheels are centered in chucking so rim thickness is balanced after machining.

MILLS OFFER SPECIALTIES Horizontal boring, drilling and milling machines now may include remote control, power rotary tables, electronic drive and feed, nonmetallic bearings on saddles and column bases and other refinements.

The concluding installment of this prevue will appear in AMERICAN MACHINIST *for Aug. 14.*





SPIDER ARMS TO LENGTH—Ends of opposite trunnions on universal-joint spiders are ground to length within 0.001 in. in this 20-in. wheel, double-disk grinder. Tolerance for total indicator reading, when the spider is rotated about the other pair of journals, is 0.002 to 0.005 in. The drum carries eight peripheral work-locating end clamping fixtures and is rotated at 2 to 3 rpm. by a separate variable-speed drive. Tension springs hold each clamp on the spider-grinding fixture open until the plate on the operating lever contacts the clamping cam between the grinding wheels. Fixtures on the drum are interchangeable for different sizes of workpieces, and are arranged to hold the work on a 20-in. dia. work circle. Trunnions being ground are located in hardened-steel V-plates, while the other two trunnions are located in U-slots to center the piece properly. Loading is by hand. Finished parts drop into a chute. Automatic sizing (adjustment of wheels to compensate for wear) is essential, because the operator does not have time to gage parts if the machine is to be operated continuously

Fixtures Make Disk Grinders Versatile

BY FRED C. SCHAUB

CHIEF ENGINEER, HANCHETT MANUFACTURING COMPANY

SINGLE- AND DOUBLE-SPINDLE disk grinders, with 10- to 30-in. dia. wheels, are being applied to a wide range of production grinding through development of fixtures which multiply capacity many times.

Often it is possible to obtain better results on a double-spindle disk grinder than on a surface grinder, especially when grinding thin parts having opposed parallel surfaces of nearly equal area from which approximately the same amount of stock must be removed. With the double-spindle unit, such parts can be arranged to "float" between the two opposed wheels so opposite surfaces are ground flat and parallel without warping.

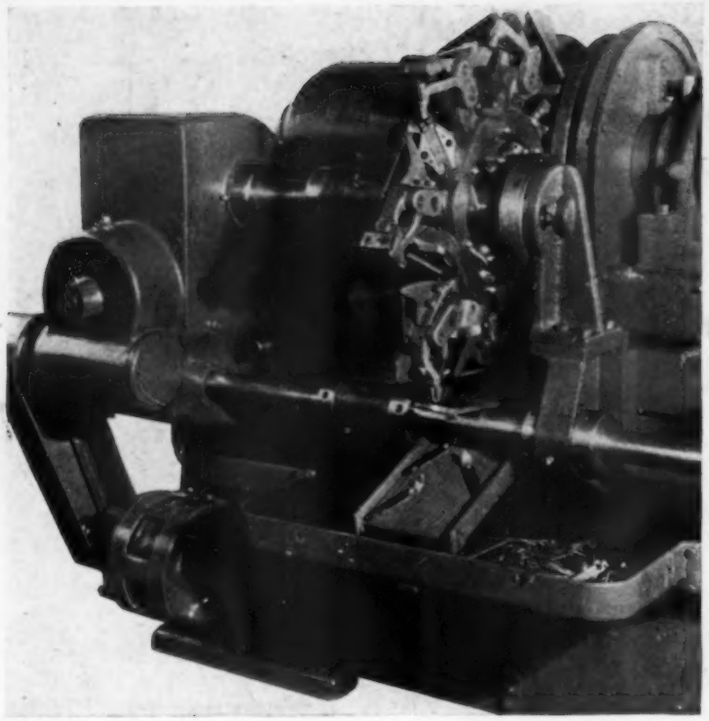
Where only one surface is to be ground, single-spindle disk grinders often are used. But, production usually can be doubled by using double-spindle machines, with a fixture that holds two parts at each station.

Three basic types of fixtures include rotary drum-type, straight-through, and oscillating or reciprocating. Rotary fixtures usually require separate, variable-speed drives for drum rotation, while the other two types can be hand or power operated. Depending on the workpiece, design of the fixture, and nature of the operation, dimensional tolerances ranging from 0.0005 to 0.001 in. usually can be held without difficulty.

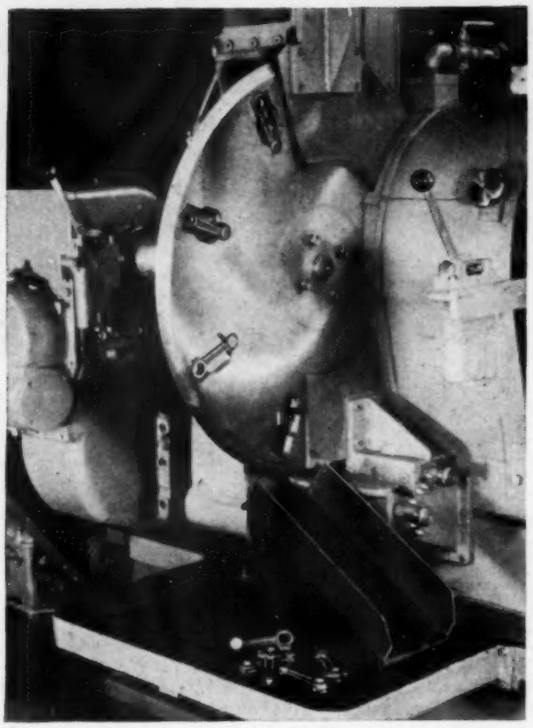
Rapid finishing can be done on single- and double-spindle units with properly designed fixtures. Typical ones are pictured here

Rotary drum fixtures can be arranged for (a) floating parts in the carrier plate, (b) chain or tension band clamping of parts on the fixture drum, with automatic ejection after parts have passed between the grinding wheels, and (c) clamping of the parts in individual workholding fixtures around the drum periphery.

Pieces difficult or impossible to clamp because of shape or size, often can be ground on opposed parallel surfaces by floating them in pockets in a rotating carrier plate. Tension-band or chain clamping permits a greater number of workpieces to be positioned around the circumference of the rotary carrier. Individual clamping offers more secure location and is necessary when surfaces ground must be square with locating surfaces. In many cases, part shape



CAN-OPENER TIPS—This special rotary fixture holds beer-can openers for grinding the two cutting edges on points. Clamps are spring-loaded and operated by contact with a hardened-steel cam bar between the grinding wheels. One edge of the point is ground as the piece is traversed across the face of one wheel. Then a cam swings the fixture to the other side as the piece passes across the hole in the wheel center so the other edge is ground on the opposite wheel. With eight workholding fixtures on drum, which is rotated at 2 to 3 rpm., production ranges from 16 to 24 pieces per min. Parts drop into chute as clamps open automatically when fixtures pass from between grinding wheels



CONNECTING-ROD FACES—This rotary fixture grinds opposite faces on both ends of small connecting-rod forgings. The 26-in. dia. carrier plate has eight nest holes in which parts float. Distance between parallel ground surfaces can be held within 0.0005 in. A spring-loaded knockout bar at the bottom of the fixture ejects finished workpieces to a chute. The drum rotates at 2 to 3 rpm., and loading is done by hand

FIXTURES FOR DISK GRINDERS

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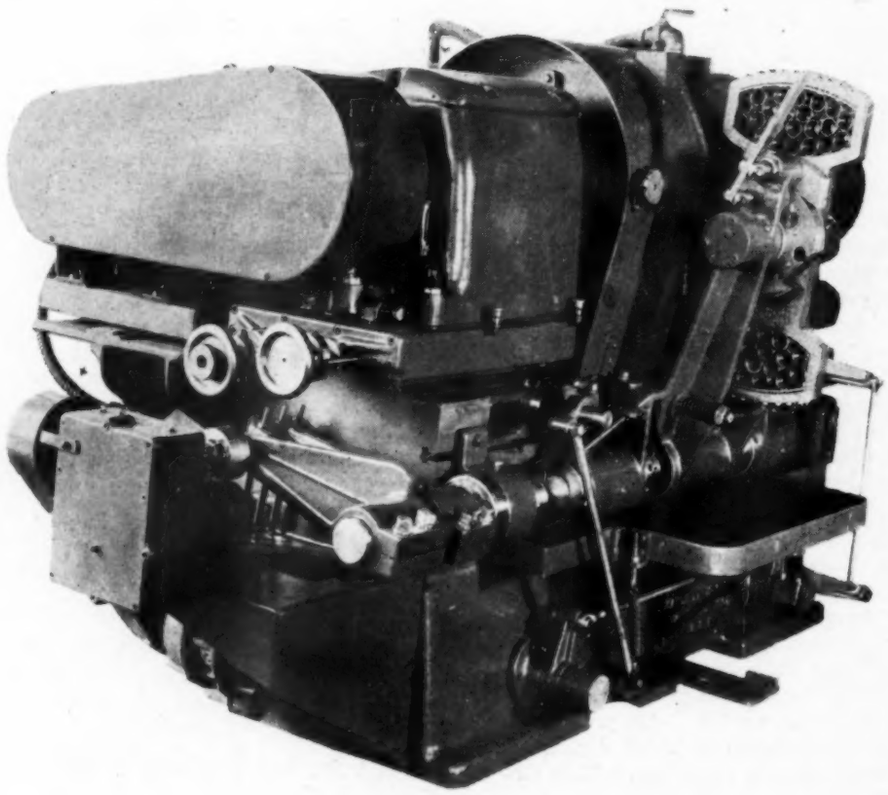
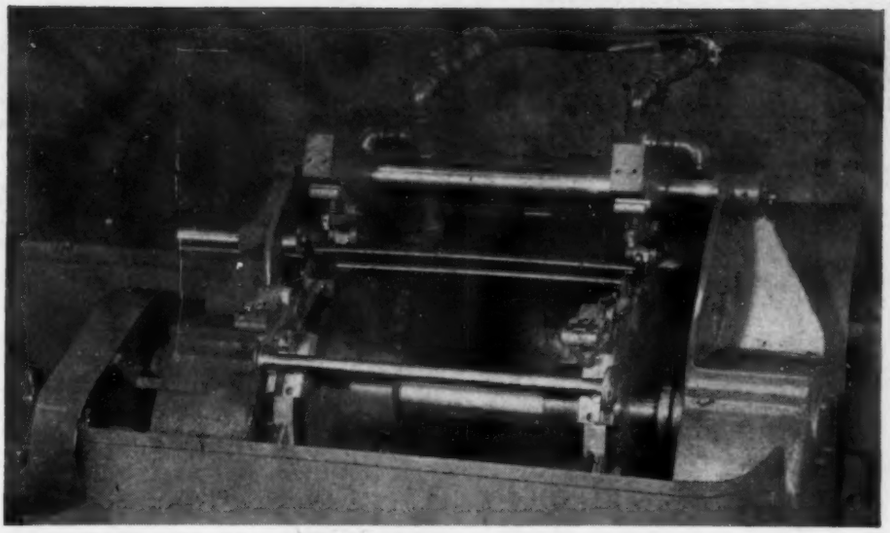
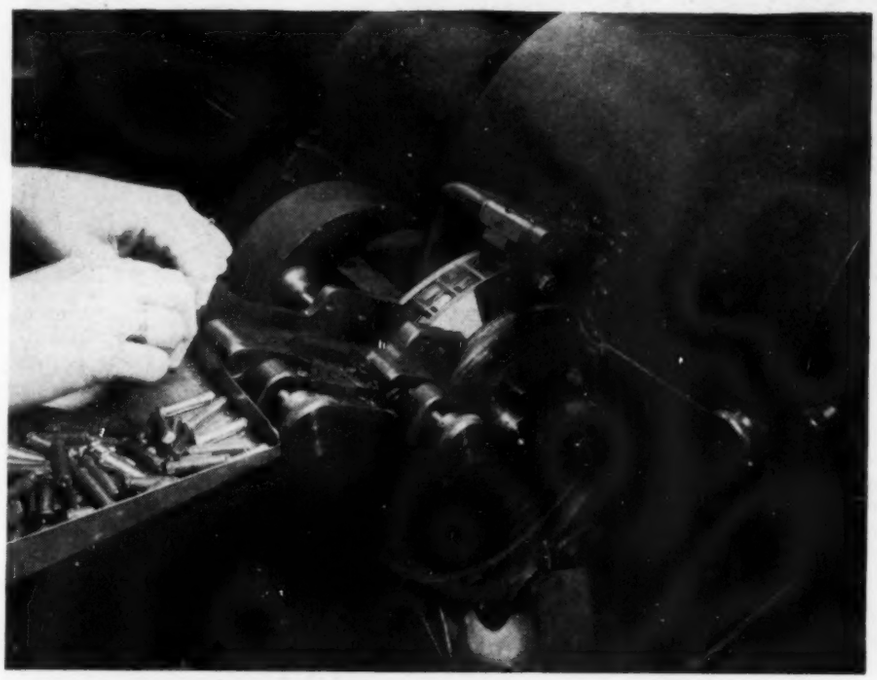


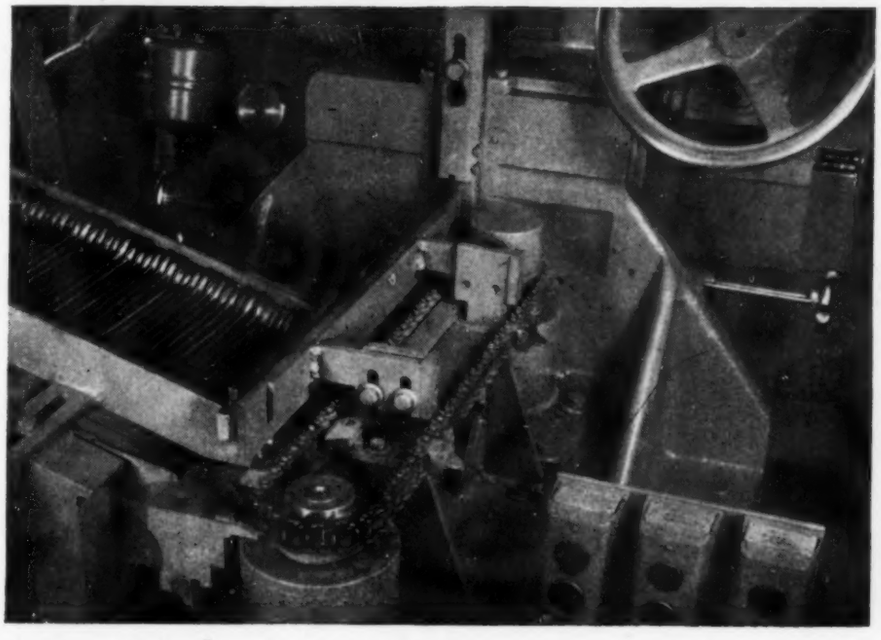
COIL SPRINGS — This double-end oscillating fixture grinds both ends of steel coil springs to length. Pieces are loaded in tubes in one end of the fixture while loaded other end is positioned between grinding wheels (at 90° from position shown). The fixture oscillates during the grinding cycle; indexing is by hand. It is necessary to keep the workpieces between grinding wheels for a sufficient time to release all compression forces on the springs. While bushing diameters are slightly larger than springs, there cannot be too much difference, as a sloppy fit will not permit grinding spring ends square with spring axes

CUTTER-BAR FIXTURE — This fixture is designed for grinding lawnmower cutter bars and tubes to length within plus or minus 0.001 in. The two fixture drums are adjustably mounted on the drum spindle, so they can be set for workpieces of different lengths. Each drum carries automatic clamping heads. Drum assembly rotates at 2 to 3 rpm. Fixtures are interchangeable with others for holding different parts





CORE PIECES—This rotary-drum fixture has 30 work-locating stations around its periphery for grinding ⅜-in. steel core pieces to length within 0.001 in. at a production rate of 60 to 90 pieces per min. Parts are loaded into drum stations by rolling them down the chute in front. Side plates on chute are adjustable for pieces 2 to 2½ in. long. While passing between the grinding wheels, pieces are held in drum notches by a spring-steel tension band. After pieces leave the band-tension area, they drop automatically into a delivery chute. Variable-speed drive rotates the drum at 2 to 3 rpm. The operator gages pieces occasionally in order to adjust wheels for wear



OPEN-END WRENCHES — A chain feed is used with this straight-through fixture for grinding both faces on both ends of open-end wrench forgings. Workpieces are loaded into feed chute by hand, and moved into feeding position by friction of V-belts which form bottom surface of feed chute. Side bars on chute are adjustable for wrenches of different lengths. From feed chute, wrenches are moved by hooks on feed chain between guide bars. Speed of the feed chain is variable but for operations of type shown speed usually is about 30 fpm. Wrench faces are ground parallel within 0.001 in.

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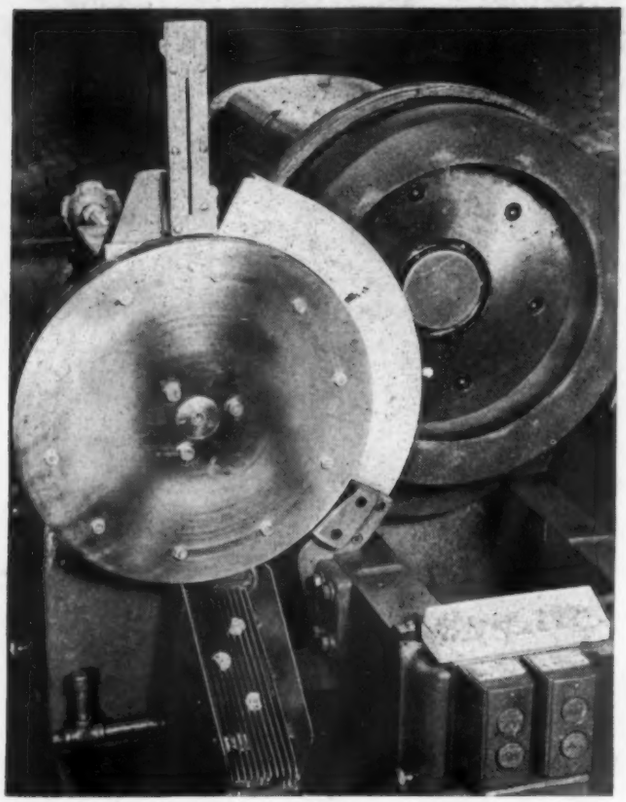
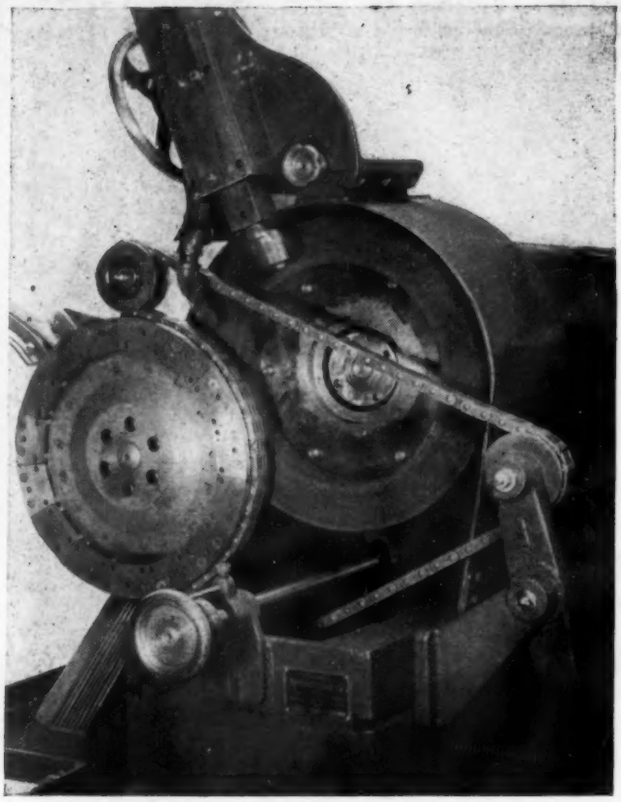
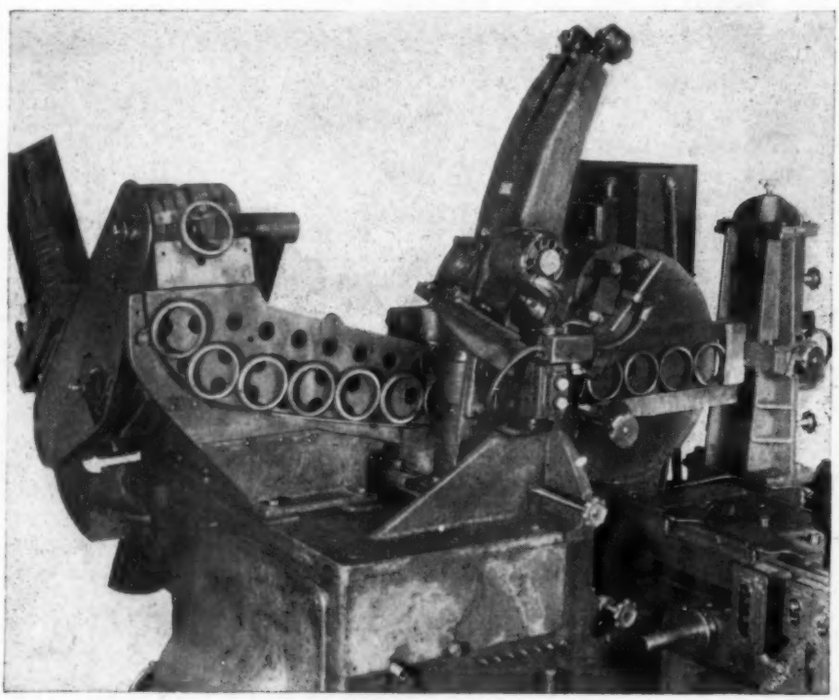


SINGLE-FACE GRINDING—Where only one face of each part need be ground, rotary drum fixture can be used on single-spindle disk grinders. Here, aluminum parts are loaded into a magazine for automatic feeding into pockets on one side of the periphery of a constantly rotating drum. Thickness of workpieces can be held within 0.005 in. The 14-in. dia. drum has 20 pockets and is rotated constantly at 2 to 3 rpm., giving a production of 40 to 60 pieces per min. The retainer shoe above the drum holds workpieces in drum pockets until they have been carried past the grinding wheel. Finished pieces drop into the chute below the drum



AUTOMOTIVE TAPPETS—Chain clamping can be used with rotary-drum fixtures on either single- or double-spindle disk grinders. This single-spindle setup is for grinding one end of automotive tappets. Plates on the drum have hard plugs and V-blocks to locate the tappets so they will be ground to length and square within close limits. The 20-in. dia. drum has 32 stations and is operated at 2 to 3 rpm. Chain tension is maintained by a spring-loaded idler at rear. Parts are fed to drum pockets by the chute at left of the drum. A similar device often is used with a double-spindle machine for grinding both ends of automotive tappets at the same time

BALL-BEARING RACES — Straight-through fixtures feed parts at higher production rates than any other type. They are applicable to parts having identical opposite surfaces which must be ground parallel and flat within close tolerances. In this setup, one head of the double-spindle grinder has been removed to show fixture details. This unit grinds opposite faces of ball-bearing races. Races are picked up individually from the feed chute by pin straps on a V-belt elevator and dropped into the feed-guide chute. Top and bottom guide bars between grinding wheels hold races in position as they are forced between wheels by rubber feed rolls. Rolls and guide bars are adjustable for work diameter and thickness. Rubber rolls have variable-speed drive to feed work at 20 to 60 fpm. between the 22-in. dia. grinding wheels. With such fixtures, thickness usually is held within 0.0003 in. Automatic size control cannot be used



will determine the type of clamping.

Straight-through fixtures offer the highest production, and are applicable for holding parts having identical opposite surfaces whose parallelism and flatness are the only close-tolerance factors. Parts such as piston rings, roller-bearing races, wrench heads, and strip steel are typical. Materials such as plastics and ceramics also can be ground.

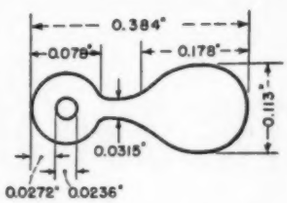
Some straight-through fixtures employ rubber rolls, others use chain-feed devices. With these fixtures, the parts continue to feed themselves through the grinding area after they leave the feeding mechanism. In many cases, similar parts of different sizes can be fed through the same fixture, by adjusting or changing the feeding mechanism and the work guides.

Oscillating or reciprocating fixtures, of both hand and power feed types, carry work in a rigid, clamped position, or hold pieces in cavities so they will float between the grinding wheels. Even though grinding time usually is longer than with either of the other two types, good production can be obtained. Hand-operated fixtures are employed for small lots, hydraulically or mechanically reciprocated fixtures where production requirements are higher.

Where parts are clamped solidly, some form of automatic sizing can be employed. Such devices automatically check finished parts as they leave the grinding area, and feed the disk wheels together in order to compensate for wheel wear. Automatic sizing cannot be used where the parts float in pockets, or where they are held in position with tension bands or chain clamps, because they can then shift sufficiently to prevent accurate gaging under automatic conditions. In these cases it is necessary for the operator to check occasional pieces and make compensating wheel-position adjustments when finished dimension approaches high side of tolerance range.

AUXILIARY STRIPPER PREVENTS PUNCH BREAKAGE

Piercing close to blank edge allows work to cock and break the punch



Sheet-metal blank (22 gage) has a 0.0236-in. hole pierced 0.0272 in. from the end. Piercing a hole smaller in diameter than the work thickness was complicated by work dimensions

BY FEDERICO STRASSER
Santiago, Chile

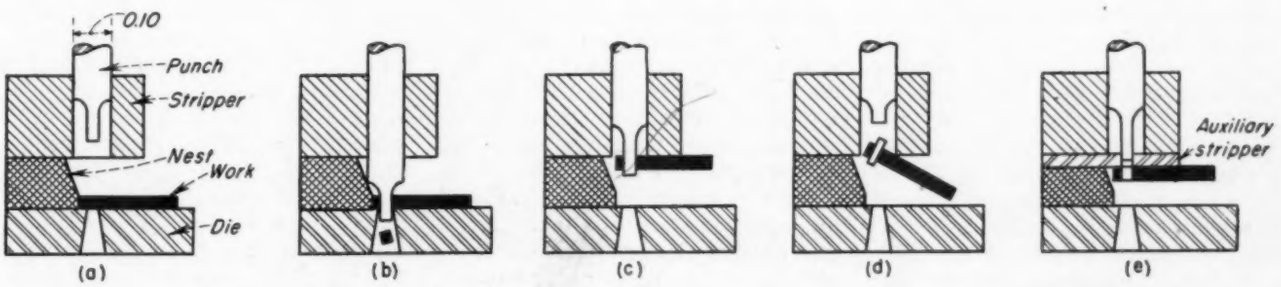
SMALL-DIE WORK has its own headaches—and remedies. Not only does hole size and material thickness affect the piercing action, but location of hole also can introduce trouble. A common occurrence of this trouble is caused by the hole lying close to the edge of the workpiece.

A recent job required punching a 0.0236-in. hole in sheet-metal stock, gage No. 22 (0.0313 in.), at a distance of 0.0272 in. from the edge. Two dies, one blanking and the other piercing, were built for the job. The blanking operation presented no difficulties, but piercing was a complete failure because a punch was broken at every stroke of the press no matter how carefully the press was operated.

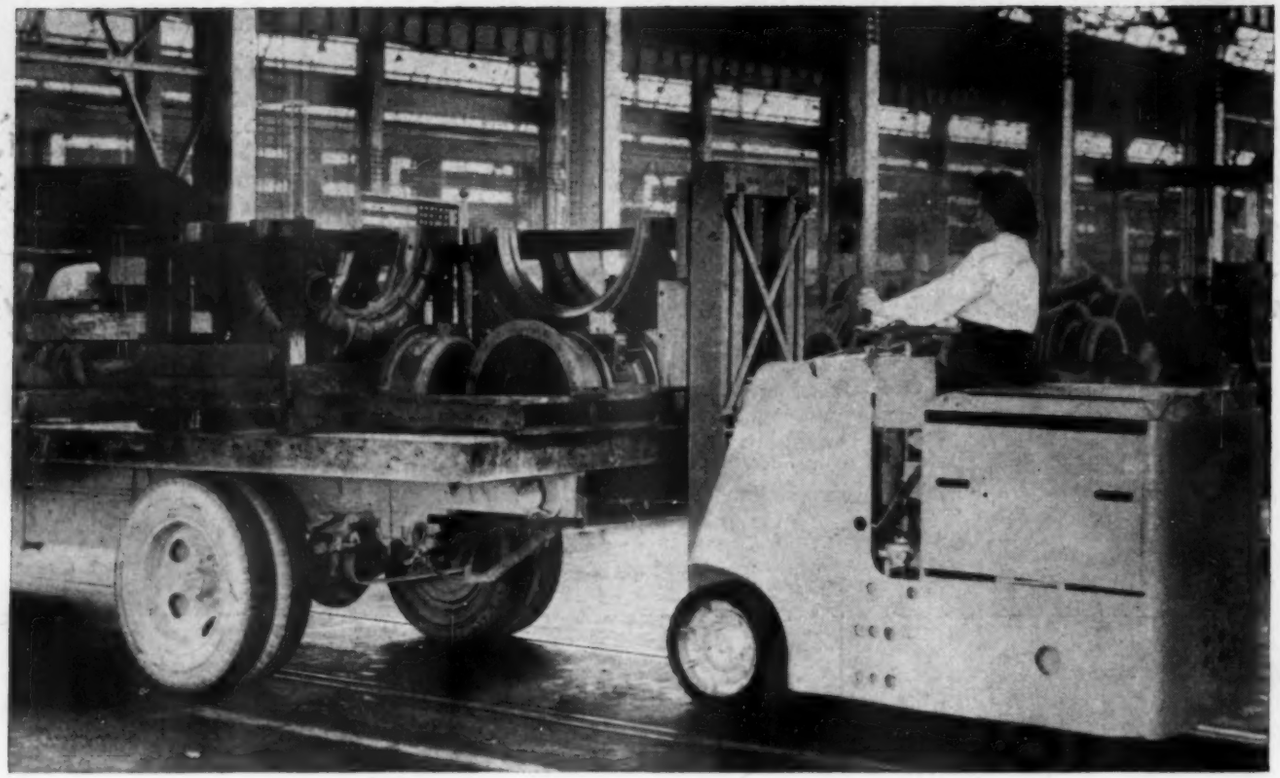
Each phase of the operation cycle was analyzed to isolate the trouble. With the die open, the blank was placed in its nest. As the punch, guided on its shank by the stripper, descended, it pierced the hole without trouble, but on rising it carried the blank until the latter came into contact with the lower surface of the stripper.

Under normal conditions, the blank would have been stripped from the punch and fallen back on the die. Instead, the blank was cocked so its end entered the guide hole in the stripper, thus snapping off the point of the punch. As this cocking action was caused by the guide hole of 0.10 in. being of greater diameter than the length of the end of the work (0.078 in.), the remedy was at once obvious.

A thin, auxiliary stripper of hardened tool steel with a guide hole only slightly larger than the punch point was inserted between stripper and nest. By preventing any tilting of the workpiece, and by providing better support and guiding action to the punch, the auxiliary stripper eliminated all punch breakage.



Operation-cycle analysis showed piercing of hole, after setup as in (*a*), was accomplished, (*b*), with no trouble. Normal stripping action, as in (*c*), would have caused no punch breakage as did actual stripping action, (*d*). Auxiliary stripper in (*e*) eliminated work cocking and punch breakage by stripping work evenly off punch



PALLET LOADS, carried between buildings on flat-bed trucks or rail cars, are loaded and unloaded by fork truck. Layout standards provide ample space at transfer points to reduce handling time and truck maneuvering

STANDARDIZED HANDLING METHODS and

At G. E. Erie, handling equipment and methods were standardized to simplify and expedite all intra- and inter-plant movement, as discussed in this article prepared with the cooperation of . . .

FLOYD E. BLIVEN
SUPERVISOR OF SALVAGE, ERIE WORKS, GENERAL ELECTRIC CO.

EMPLOYMENT of standard handling equipment and standardization of methods, together with development of a plant-layout program, have simplified what otherwise would have been a complex job of materials handling, transport and storage in all buildings of the ten divisions comprising the General Electric Erie Works. Well over a half-billion pounds of material—each pound of which is handled at least five times from receipt, through process and into outbound shipment—pass through the plant in a year.

A well-thought-out and continuously supervised plan, including a program governing the layout of storage and manufacturing areas in the huge ½-mi. square operating zone of the plant, insures accessibility of material and ease of receiving, handling and dispatch within the various divisions.

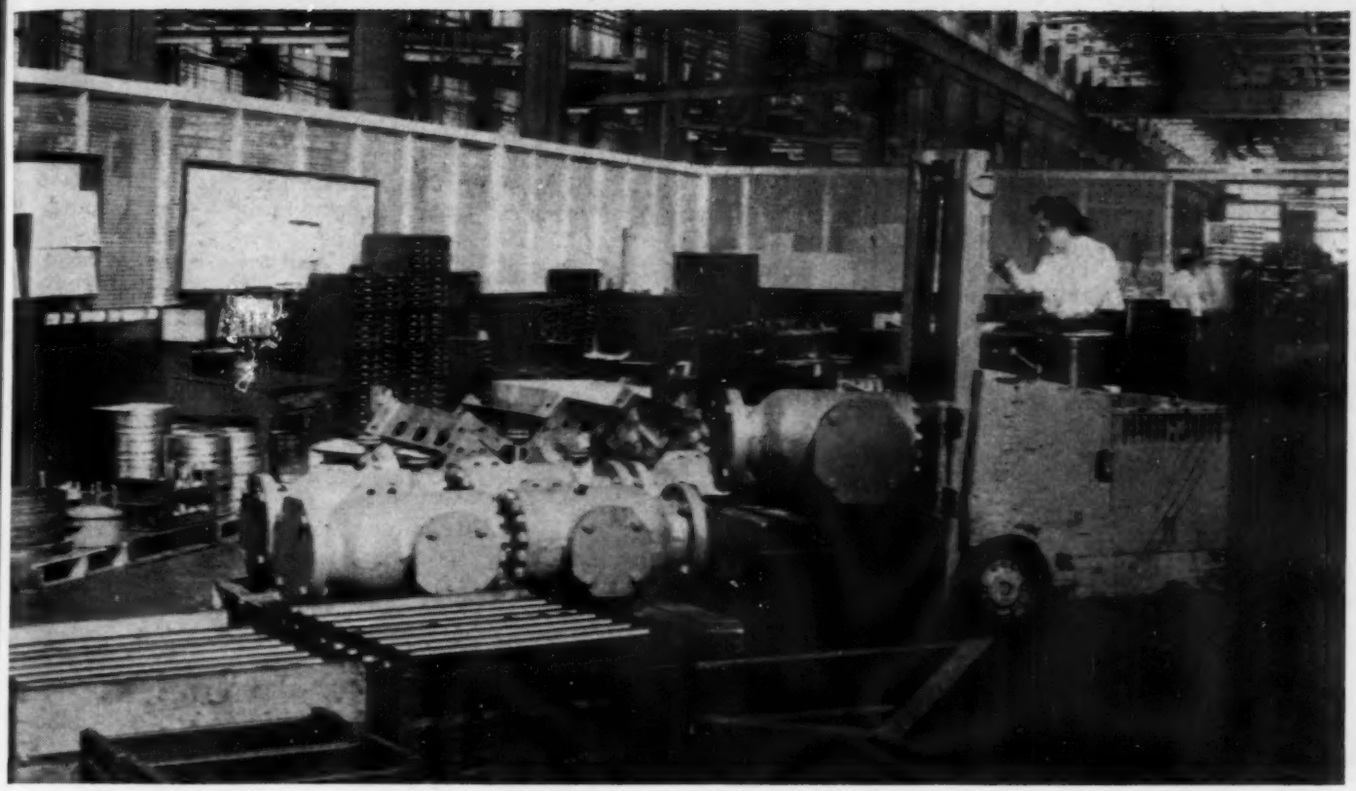
Some 29,000 lin. ft. of paved roadway and approximately 15 mi. of standard-gage railroad interconnect the various divisions and buildings, and intersect outdoor storage yards and craneways, the latter connecting with craneways within the buildings. Certain types of incoming material intended for storage is taken direct to craneway storage areas, either by rail car or by highway-type trucks and trailers.

Yard storage areas under the cranes are increased substantially by palletizing the loads, both incoming material and also material awaiting machine operation. Certain material in inter-divisional transport also is placed in temporary storage in these areas.

A study made by plant engineers of the craneway storage areas revealed that use of palletized loads under crane supports recaptured more than the area necessary for installation of railroad tracks, including the man-clearance allowance on either side.

Buildings comprising the ten divisions are from 800 to 900 ft. long and from 200 to 446 ft. wide. Each building has a crane yard of from 60 to 75 ft. span, generally running the full length of the building, while the area under these cranes has been concreted to facilitate materials handling.

In standardizing equipment to handle burdens of up to 3 tons, preference was shown for the storage-battery-powered industrial truck for many reasons. Among these were their ease, quietness and accuracy of operation; low cost of mainte-



"IN-PROCESS" STORAGE of pallets and skid boxes at 45° to traffic aisles insures instant accessibility and reduces the space that must necessarily be provided to permit easy truck maneuverability into and out of the storage area

LAYOUT INTEGRATE MATERIAL MOVEMENT

nance; high availability for close scheduling of operations and the manner in which operations could be coordinated with other materials-handling equipment, such as highway-type trucks and trailers, railroad cars and cranes. As equipment and methods are standardized throughout the plant, equipment is shifted from one division to another when the amount of handling work in the various divisions varies.

Two general methods of handling, both based on the unit-load principle, have been adopted as standard. One calls for use of the pallet-fork-truck method for all materials having a unit weight up to 3 tons. Heavier materials and those too bulky for pallet handling, such as bar stock, are handled by overhead crane. The main cranes in building bays are supplemented by small motorized boom-arm cranes.

Stock areas under roof are well placed to give minimum length moves. Even so, many stock sections would be over-crowded and unsafe for operation if application of fork trucks to handle the many and varied palletized loads were not an accepted practice.

All photographs courtesy of General Electric Co.

MERCHANDISE in cartons, received from shipper in strapped unit loads, is tiered in receiving department temporary - storage area. Inbound palletized loads eliminate costly car-door palletizing

Pallets Are Standardized

Further simplification of the handling system has been obtained by standardization of pallets in three sizes. One is 3x3 ft., the second is 4x4 ft., while the third—recently added to take care of truck shipments with greater efficiency—is 48x42 in.

Three general weight groups for unit loads also have been fixed. These are for loads of 1, 2 or 3 tons. Battery-powered fork-lift trucks of the three corresponding capacities have been adopted by the Erie

Works as standardized equipment.

Within each division, the industrial truck equipment consists of one, or more, fork trucks of any one or all of these capacities, a battery-powered burden-bearing, platform truck and a varying number of pallet-handling hand-lift trucks, most of them with electric drive.

Such standardization of equipment has resulted in quicker movement of materials, both intra- and interdivisional. In the latter case, unit loads dispatched from one building must be adapted for ease of unloading in the building or area to which it is dispatched.

Procedure in the handling of incoming materials calls for palletizing of items, unless they have been shipped on pallets by the supplier, and removal to storage by means of fork trucks. The first two sizes of pallets are used in storaging operations, depending on the bulk of the items. Three-ton fork trucks tier loads two to four high, as loads range up to this weight. The same truck later will move pallets from storage to start of processing.

Because a considerable amount of time is lost in palletizing incoming materials that could not be loaded by the shipper in units of from 1 to 3 tons on pallets, a determined effort is being made to have suppliers equip themselves to make shipments in unit loads and, conversely, to have consignees so equipped as to receive and handle unit-load shipments.

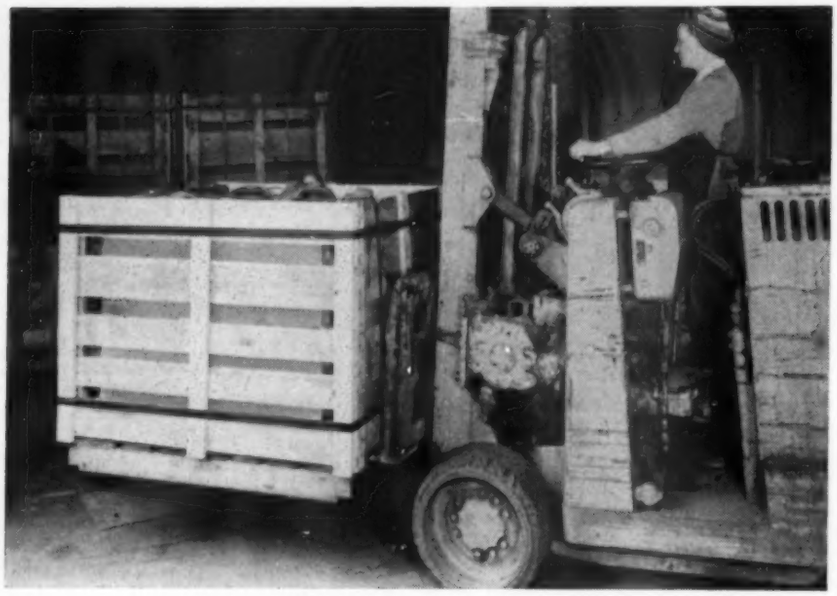
Considerable progress in this direction is being made as shippers and consignees become aware of the savings in time and money that accrue from mechanized materials handling, and especially in handling in palletized unit loads.

Handling Equipment Coordinated

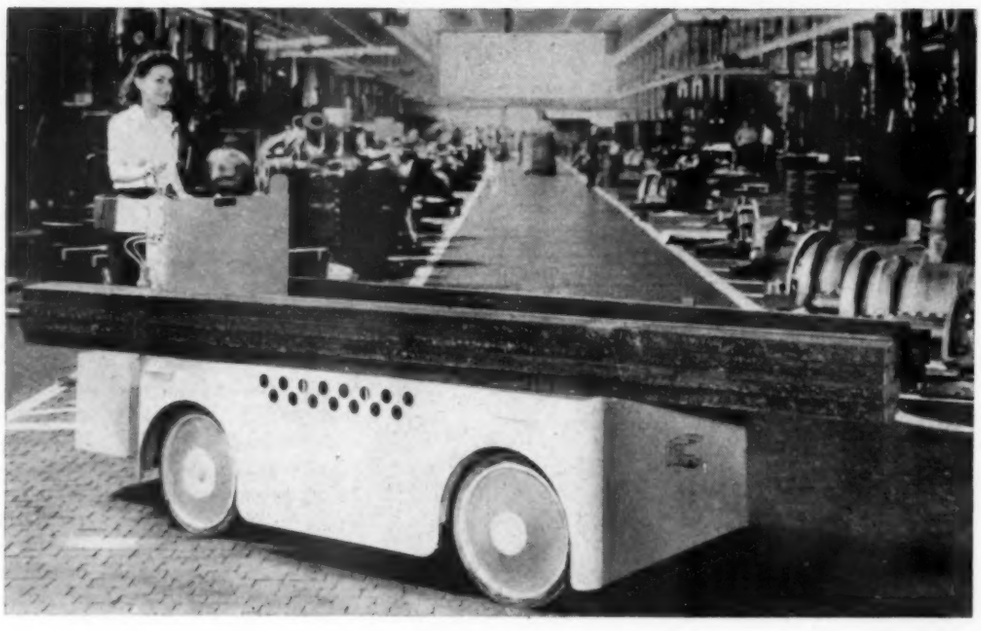
When incoming shipments, for any reason, cannot be unloaded in the division for which they are intended, the freight car or highway truck is unloaded and its contents moved from the available discharge area by coordinated use of fork trucks and interplant transfer rail cars or highway trucks. Pallet loads are quickly moved from one building to another on these carriers, which are loaded and unloaded by fork trucks. The same procedure is followed in movement of material in process or into outbound shipment.

While overhead cranes and transfer rail cars move materials too heavy for handling by industrial truck, transfer cars are moved about either in trains by diesel-electric locomotives manufactured at the Erie Works, or singly by burden-bearing industrial trucks.

Handling operations are coordinated. For example: During the war, turbine rotor forgings, weighing perhaps 12 tons, were received on a gondola or flat-car by rail, moved to storage by overhead crane and then moved, also by crane, to a smaller transfer rail car. The trans-



PALLET BOXES, designed for shipment of castings, reduced car-loading time from 112 to 12 manhours. They are knocked down for return shipment by freeing the straps and removing corner staples



STEEL BAR STOCK is handled on burden-carrying trucks equipped with stake pockets for safety in handling round stock. By cutting down control-panel width, long lengths can be carried "in line" with direction of travel, instead of cross-wise or at an angle

fer car, in turn, was moved by a burden-bearing truck to the craneway of the manufacturing area, where movement into process was handled by inside crane.

In-process movement of materials is made on pallets, in skid bins or, in the case of small parts, in accumulating tray-skids. Scrap, waste and such salvage material as lathe turnings are moved in huge trays or in bins, either by overhead crane onto highway trucks or transfer rail cars, or by fork truck.

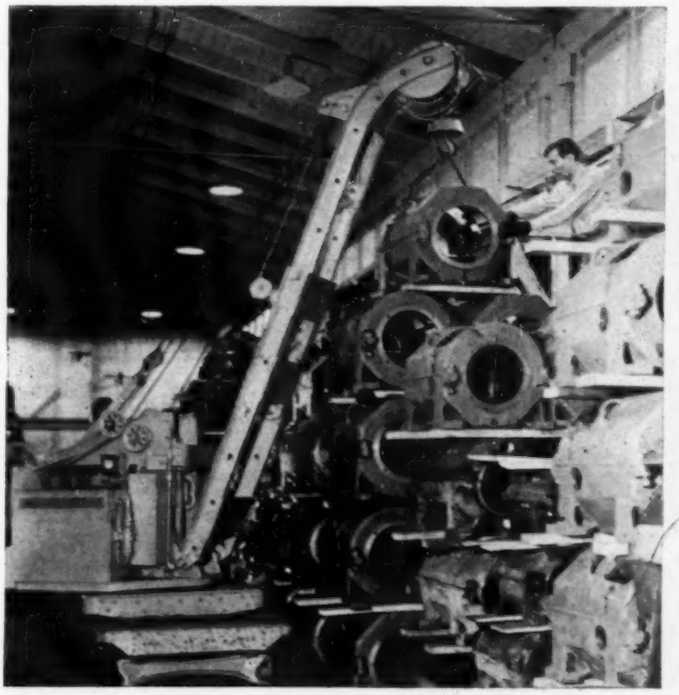
During 1946, about 60,000,000 lb. of scrap were handled. These scrap turnings were segregated into various sales classifications, such as open-hearth machine steel, straight chrome steel, nickel steel, carbon molybdenum and turnings. About 86% of salable scrap is steel, 8% is non-ferrous and 6% non-metallic. About 50% of the non-ferrous and copper scrap is used in making alloy castings in the plant.

Bar stock, either square or round, is moved by burden-bearing trucks, equipped with stake pockets and so designed as to permit carrying the stock "in line" with truck movement instead of at an angle across the platform. In the foundry, castings are carried in skid boxes by platform or fork trucks. For shipment of certain castings, pallet boxes have been successful. Formerly these castings were packed in bags and hand-loaded into cars or trucks for shipment.

TRUCK MOVEMENTS are controlled and dispatched by storekeepers of various divisions. Operators, after receiving an order, check it against the pallet load. In manufacturing or storage areas requiring continuous trucking, operators receive move orders direct from loads

Shipping Pallet Bins

For shipment of castings from the Erie Works to a G.E. plant in Massachusetts, a special type of carrier was devised. This consists of a 4x4 ft., single-faced pallet on which is assembled a collapsible, four-sided bin. Such a container will hold up to 3 tons. Use of these pallet boxes for shipment and fork trucks to stow them in freight cars reduced aver-



MOTOR FRAMES, moved to storage area by fork truck, are tiered 5-high by 3,000-lb. platform crane truck. Dunnage strips between frames facilitate vertical storage

STORAGE SHELVES allow unequal pallet loading, provide ready selectivity and permit safe storage of items such as strip copper used in coil winding

age time of a car loading from approximately 112 to 12 manhours.

Boxes are placed two-wide and two-high in the cars, 24 containers to a car. They are easily knocked down for return shipment and reuse. Although intended originally for shipment of castings only, these pallet boxes now are used for shipment of scrap copper and other materials.

It is in storage of materials awaiting processing and movement into assembly and thence into shipment that different types of trucks are operated in coordination. Several battery-powered trucks are kept available for special duties.

A platform crane truck, for instance, had a job created for it in a storaging operation. Additional manufacturing space was needed in a building and the only available area was used for storage of armature and motor frames. A nearby shed was pressed into service, but there was no available crane. Frames, however, were placed on pallets, moved into the storage shed from the manufacturing area and deposited. Cranes then lifted the frames from the pallets and tiered them five-high, dunnage strips being placed between frames to facilitate vertical storage.

In establishing standardization of industrial-truck equipment, battery-powered trucks of 1-ton capacity were selected for fast, flexible movement of materials from machine to machine during processing. Two-ton trucks were designated for all building moves and delivery of pallet loads to machining operations, and 3-ton trucks for moving materials from yard to building and for movement of heavy pallet loads within buildings.

Still larger trucks, 3½-ton capacity, were selected for car-loading and for some interplant transport of heavy items on specially adapted pallets. For instance, armatures are moved on pallets, being protected by saddle-shaped, padded racks during movement. In storage, these armatures are handled by a platform crane which places them in special racks. Special die-handling trucks of 6,000 to 10,000-lb. capacity and equipped with motor steer were applied to handling sheet material and dies.

Zoning Improves Truck Control

All divisions at the Erie Works are zoned, with one or more trucks assigned to each zone. The general storekeeper in each division is charged with control of all truck movements. Dispatch orders are received by truck operators direct from the storekeeper, except in zone areas having relatively dense traffic. In these, the operators work from orders moving with the loads.

In the various plants, layout for operations, storage and traffic movement is planned for ease of receipt, handling, and dispatch and safety of traffic. In-process storage areas are provided to accommodate two pallets at an angle of 45° from the traffic aisle. This cuts down the space needed for the truck to turn from the traffic aisle and yet provides instant accessibility to the load.

In certain manufacturing areas, handling motions are saved by doing work directly on pallets placed on work benches by fork trucks. Adequate provision is made in this area for trucks to bring work to, and remove it from, the benches.

As assorted small lots of materials sometimes have to be placed in in-process storage, racks and shelves are provided to receive them. Fork trucks place and remove palletized loads from shelves with ease, despite unequal loading of pallets or variable time of material use.

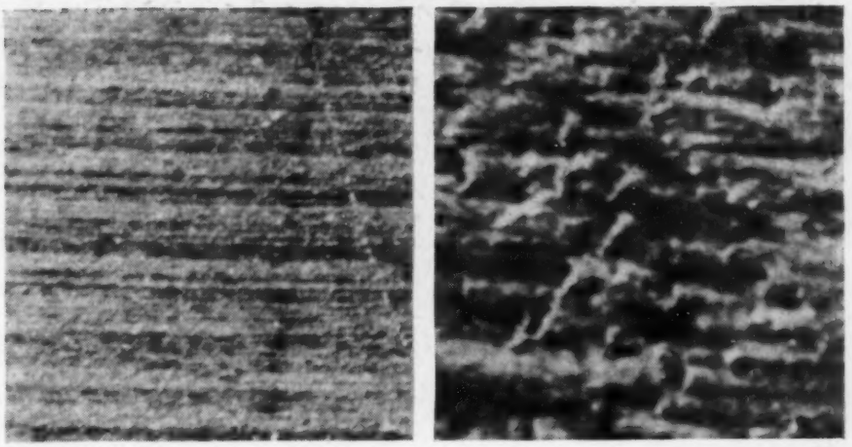
Each building in which trucks operate is equipped with a battery charging and changing station and a maintenance shop. Batteries are changed with overhead hoists, while charging leads are held overhead on reeled cables. Thus the floor area is kept free whether there is "in-truck" or "on-rack" battery charging. Batteries generally are charged in off-peak hours.

Man-depth repair and greasing pits permit ready access to trucks during checking and greasing operations, while in some divisions and in general maintenance sections, hydraulic hoists with an adapter frame for all types of trucks elevate trucks above floor level for similar operations.

TRUCK MAINTENANCE AND BATTERY CHARGING are vital to satisfactory performance, so each building in which trucks operate is equipped with a battery-charging station for "in-truck" or "on-rack" charging

Research Makes Milling Cutters Behave

BY CHESTER RICKER
DETROIT EDITOR



EFFECT OF CUTTING SPEED on surface finish: at left 115 fpm., at right 572 fpm. Both are the same magnification and in each case depth of cut and feed per tooth were the same. Profilometer readings are 160 (left) and 30 rms.

MANY TABOOS and rule-of-thumb ideas were knocked into a "cocked hat" by Dr. A. O. Schmidt when he told the Detroit Section of the ASTE some of his findings in metal-cutting research for milling machines. His experiments covered basic experimental work on materials and designs of cutting tools. Dr. Schmidt has charge of metal-cutting research for Kearney & Trecker.

Loading and unloading time is the most important factor when sintered-carbide tools are used, he said. In fact, it is almost necessary to use workholding fixtures that permit loading and unloading while the previously loaded unit is being machined.

Some of the conclusions which he obtained were that tool forces remained uniform over a wide range of speeds, and with various tool materials, as long as the tool edge stood up, but rapidly increased as the tool wore. For example, up to 2600 fpm. cutting speed, removing 10 cu. in. of steel, the best performance was at about 600 fpm. When the same material was cut at 3280 fpm. with the carbide-tipped tools only 4 cu. in. of steel could be machined and the carbide tip had worn away.

Chrome-plating the finished carbide tool made no appreciable difference in the life or cutting ability. On the other hand, plating the forward chip space surface of the tool improved the cutter performance. Preventing the hot chips from sticking or getting caught in the cutter body prolonged tool-tip life.

The effect of cutting speed on surface finishes is an important factor in machining. Experiments indicated that the rake angle had little effect on the surface finish of the workpiece. The heavier the cut the rougher the finish but the longer the tool life. With an increase in speed and a lighter cut the finish is smoother but tools wear faster. Positive rake is best for aluminum, wrought iron, copper and cast iron, but negative rake is desirable for mild steel (—6°) and hard steel (—12°).

"Most shop men are not power conscious enough when using carbides," Dr. Schmidt claimed. "The average machine in the shop is too slow to take advantage of them." High power and high speed are essential for best results with carbide tools. In milling cast iron, a carbide flycutter will remove more cu. in. per min. than any other type of tool. While the speed of a machine may not be increased the production can be doubled by doubling the horsepower of the drive.

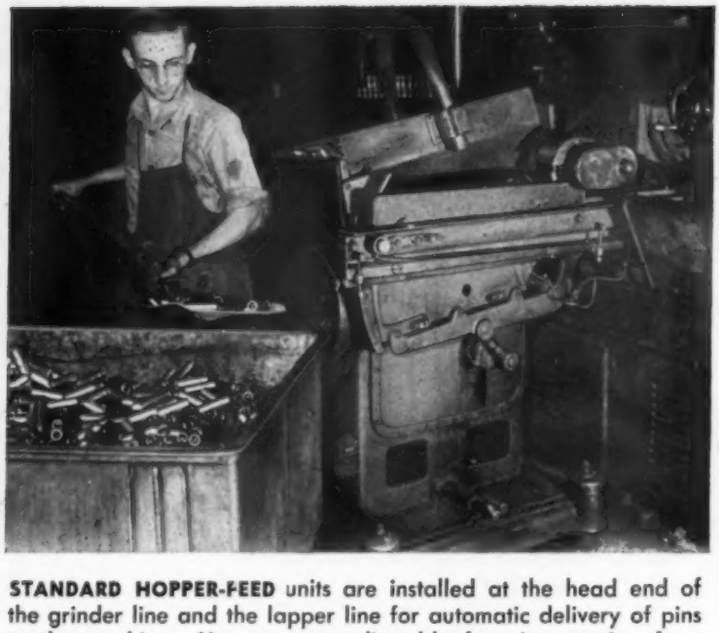
As an example, consider a cast-iron surface 4 to 5 in. wide. While a 6-in. dia. cutter will sweep this width of surface, a 10-in. dia. cutter will do a much better job. The number of teeth on the cutter is determined by the hp. of the machine motor. If the cutting speed and feed are such that the rate of metal removal is 10 cu. ft. per min., a good figure to use is one cutter blade per hp. Hence with a 10-hp. motor, ten blades are used; with 20 hp., 30 blades are used with a doubled feed rate. At the same feed per tooth the 20-hp. machine turns out twice as many pieces without increasing the cutter speed in fpm. Dr. Schmidt recommends 0.010-in. feed per tooth for roughing, taking all the depth of cut that cutter and machine will stand. However, it is not advisable to replace a 10-hp. motor with a 20-hp. motor when the machine is built for only 10 hp.

"Controlled blunting" is a practice which they have found very successful. They put a narrow negative radial face rake on the edge of the cutter tip. This runs about twice the chip thickness or 0.025 in. for a 0.010 in. thick chip. It helps maintaining the sharpness of the tip and is said to reduce the tool forces about 30% in comparison with a full negative rake, which means not only a saving in power required to drive the cutter but also lighter pressures on machine members and the workpiece. Blades are fastened into the cutter body with wedges placed behind them. This arrangement permits controlled chip clearance in front of the cutters. This clearance is radiused so the chips will be swept away from the cutting edge. This is especially important when milling wide steel surfaces or materials which form stringy chips.

Cutting speeds for mild steel with carbide tools run from 500 to 600 fpm. For tough steels running around 400 Brinell hardness this speed will have to be reduced to about 200 fpm. for maximum tool life. On aluminum and magnesuim the speed is mainly limited by the ability of the machine bearings to stand up, not by the character of the cutter.

Surface finish on tools is important. Cutting edges should be ground to 6 to 8 microinches. Honing or lapping, when applied to a series of milling cutters, did not bring about an increase of the average life of the tools. This applies to both carbide and high-speed tools.

In many shops not even the full possibilities of high-speed steel are realized, Dr. Schmidt claimed. High-speed steel and cast alloy cutters have shown an increase in tool-life as much as 100% when used on high-power machines intended for cutting with sintered carbides.



STANDARD HOPPER-FEED units are installed at the head end of the grinder line and the lapper line for automatic delivery of pins to the machines. Hoppers are adjustable for pins ranging from 7/16 to 2 in. in diameter

Piston Pins

CENTERLESS-LAPPED TO TENTHS

Six grinders and three lappers, tied together in a continuous line by chain conveyors, produce 1700 to 2600 replacement pins per hour to close tolerances

BY JOHN NYLEN
PRESIDENT, NYLEN PRODUCTS COMPANY

SIX NO. 2 CENTERLESS GRINDERS and three centerless lappers in this line finish 1,700 to 2,600 piston pins per hour, depending upon diameter and length. Pins are delivered to the line after heat-treating and shot-blasting and are packaged for the warehouse at the other end of the line. Three machine operators, an inspector and a packer keeps this line going. A break in the line between grinders and lappers permits pin inspection

REPLACEMENT automotive piston rings manufactured by Nylen Products Company are finished to a cylindrical surface accuracy of 1½ to 2 microinches. Tolerances for diameter, out-of-roundness, and taper usually are within plus 0.0002 in., minus 0.000 in. Hardness averages 66-62 Rockwell C.

To achieve these results at 1,700 to 2,600 pr hr., the pins, which are 1 to 3⅝ in. long, are finished after hardening in a series of six centerless grinding and three centerless lapping operations. Power-driven chain conveyors transfer pins automatically between machines. To permit an inspection between the sixth grinding and first lapping operations, pins are delivered by chute to tote pans, rather than by conveyor. This also permits setting up the line of grinders for a different size of pin while the lappers still are finishing one lot.

Grinding

Heat-treated and shotblasted pins delivered to the line have approximately 0.023 in. of stock to be removed. Approximately 0.008-0.009 in. is removed by the first centerless grinder, the second removes 0.006 in., the third 0.004 in., the fourth 0.002 in., the fifth 0.001 in., and the sixth only 0.0005 in. Only about 0.0005 in. of stock then is left for removal in the three lapping operations.

No. 60 and No. 80 grit grinding and regulating wheels are used in each grinder. Coolant is a 20-1 soluble-oil solution. All centerless grinders in the plant, including the six in the pin line, are served by a central coolant system. Coolant is drained back to settling tanks through underfloor pipes. Grit is settled out, the coolant reconditioned and brought to constant temperature in an under-floor storage tank before reuse.

Lapping

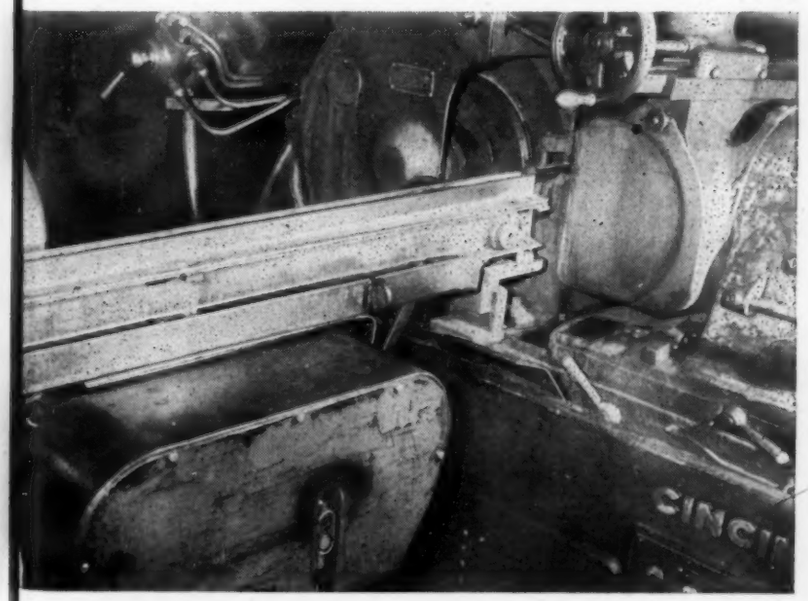
Operations in the three lapping machines also are graduated. The first grind-lap operation removes almost all of the 0.0005 in. of stock from each pin, leaving no more than 0.0001 in. of stock to be removed in the second machine. The third merely polishes the pin surface. Lapping and regulating wheels are dressed and positioned so finished pins are 0.00005 in. larger in diameter at the center than at the ends.

Regulating wheels in the lapping machines are 320 grit. A 220-grit grinding or lapping wheel is used in the first lapper, a 320-grit wheel in the second, and a 500-grit wheel for final polishing. Coolant consists of water in which a small amount of freely dissolving soap chips and some soda solution or Oakite is mixed to prevent rusting and foaming. This coolant also is handled in a central system.

Because cleanliness of wheels, work and support blades is essential when producing work to the tolerances required, coolant supply valves on each machine are opened fully to permit free flow at all times. Central supply systems are cleaned thoroughly every 7 to 10 days.

A metal work-support blade faced with hard cemented carbide, and having a 20-30° angular top, is used in the six grinders and in the first "grind-lap" lapper. A hard rubber flat-top blade is used for the second lapper, while a soft rubber flat-top blade is used for the third lapper. (Soft rubber flat-top blades were tried in the second lapper but were found to wear rapidly.) Work-rest blades for the first seven operations are set to support the workpieces so their centers are approximately ¼ in. above the center of the grinding wheel. Blades for the last two lapping operations are set to grind the work on center.

Ordinarily, wheel speed of the centerless grinder is approximately constant, finish depending upon other factors. However, wheel speed in the centerless lapper is important in quality of finish. As a general guide, lapping-wheel speed is reduced and regulating-wheel speed increased to



POWER-DRIVEN CHAIN CONVEYORS with adjustable guide rails connect the grinding machines and lapping machines so pins fed into the line from a hopper automatically are transferred from machine to machine without attention from the operators. Chains are 1 in. wide and feed the pins at 25 fpm. Motor drive unit for each conveyor is supported beneath the conveyor and enclosed for protection

A LARGE 0.0001-in. dial indicator is mounted on the base of each of the fourth, fifth and sixth centerless grinders so adjustment of the regulating-wheel housing can be easily gaged. Precise adjustment is necessary because of the close dimensional tolerances

PISTON PINS finished by the sixth grinder are delivered by chute to tote pans for inspection and delivery to the line of three lapping machines. This break in the line makes it possible to run different sizes of pins through the grinders and the lappers at the same time

PISTON PINS continued

obtain a better grade surface finish.

To maintain pin dimensional accuracy and surface finish, grinding and regulating wheels are redressed at least once, and usually twice, every 8-hr. shift. The lapper regulating wheel is trued as is the regulating wheel of the ordinary centerless grinder, but truing of the grinding or lapping wheel is entirely different. The lapping wheel must be trued so its line of contact is at an angle to the work axis. By this means, axial chatter marks remaining from previous grinding are eliminated as quickly as possible. The result is obtained by swiveling and truing the lapping wheel at a negative or opposite angle to the regulating wheel. The lapping wheel is swivelled to about 2° for pins finished in this line, while the regulating wheel is swivelled to an angle of 1½°. For other operations, the lapping wheel may be swivelled as much as 4°, while the regulating wheel may be swivelled from 1 to 3° depending upon production and finish requirements.

Rate of travel of the diamond across the face of the lapping wheel is varied to suit conditions. For rough truing, travel is about 7 ipm., for finish truing, 2 to 4 ipm., depending upon type of diamond tool, condition of diamond, type of wheel, and work being lapped. The highest available traverse rate is used when truing the regulating wheel.

In the centerless grinders, 20-in. dia. and 6-in. face grinding, wheels are used with 12-in. dia. regulating wheels. In the lappers, the wheels are 14 in. in dia. and have a 22-in. face. This long wheel is obtained by mounting three wheel sections side by side on the 6⅝-in. dia. interchangeable spindles. Individual Reliance VS drives for each centerless lapper provide infinitely adjustable speeds from 218 to 1,750 rpm., so surface speed of the wheels can be regulated easily to suit requirements.

Heat-treated and shotblasted pins, delivered in lift-truck boxes, are shovelled into an automatic hopper feed at the head end of the grinder line. This, with conveyor units between grinders, makes it unnecessary for pins to be handled again until they are delivered by chute from the sixth grinder. A similar hopper feed starts the pins through the lapper line, with finished pins delivered by chute to an oil tank at the other end. From this tank, an inspector picks up the pins by hand and places them vertically, after inspection, on the chain conveyor of an automatic spray machine. Here Stanorust No. 4 solution is sprayed over them to prevent corrosion while pins are in storage or transit. Operators at the end of the spraying machine pack finished pins in boxes for delivery to the warehouse.

Because of requirements for dimensional accuracy and high-surface finish, constant attention is necessary at the machines. Therefore, one operator takes care of each group of three machines. In each case, the operator is provided with an accurate comparator so he can make frequent checks of pin diameter as finished in each machine. In some cases, this leads to fairly frequent adjustment of the regulating wheel to maintain stock removal within the limits required.

Very precise adjustment of the regulating wheel is required at each of the last three grinding machines, so a large 0.0001-in. dial indicator has been mounted on a bracket on the base of each machine. This bracket also provides an outboard support for the rod carrying the

FINISHING OPERATIONS ON PISTON PINS

OPERATION	STOCK REMOVED In. (approx.)	GRINDING WHEEL Grade	GRINDING WHEEL Speed, sfpm.	REGULATING WHEEL Grade	REGULATING WHEEL Speed, sfpm.
1. Grind	0.009	A60-K-V	6,000	A80-R2-R	160
2. Grind	0.006	A60-K-V	6,000	A80-R2-R	160
3. Grind	0.004	A60-K-V	6,000	A80-R2-R	160
4. Grind	0.002	A80-P6-B	6,000	A80-R2-R	160
5. Grind	0.001	A80-P6-B	6,000	A80-R2-R	160
6. Grind	0.0005	A80-P6-B	6,000	A80-R2-R	160
7. Lap	0.0005	A220-05-V80	825-1,000	C320-V-BY	250-270
8. Lap	0.0001	C320-T-BY	825-1,000	C320-V-BY	250-270
9. Lap	Polish	C500-T-BY	400-415	C320-V-BY	385-400

Note: Soluble oil cutting fluid used for first six centerless grinding operations. Water in which is mixed freely dissolving soap chips and a small amount of soda solution is used in the centerless lapping machines. Two central cutting-fluid systems serve these machines so solutions can be kept clean and at an even temperature. Each system is cleaned thoroughly every seven to ten days.

shoe which contacts the indicator spindle. As shown, the indicator is fitted into a special case to prevent damage. The rod carrying the shoe is clamped to the column of the regulating wheel so any movement of this column to adjust the position of the regulating wheel is shown on the indicator dial.

Because the three operators in this finishing line are constantly alert to keep dimensions within the required tolerances, pin diameters seldom vary more than 0.00005 in. While this is of a higher order of accuracy than normally expected from a series of centerless grinding and lapping operations, we make every effort to maintain this high level. By doing so, we insure against an occasional pin of the wrong size.

VENTURI Fabricated Faster by Transfer Molding

Long-core tooling and transfer methods improves finish of deep-well plastic venturi pipes

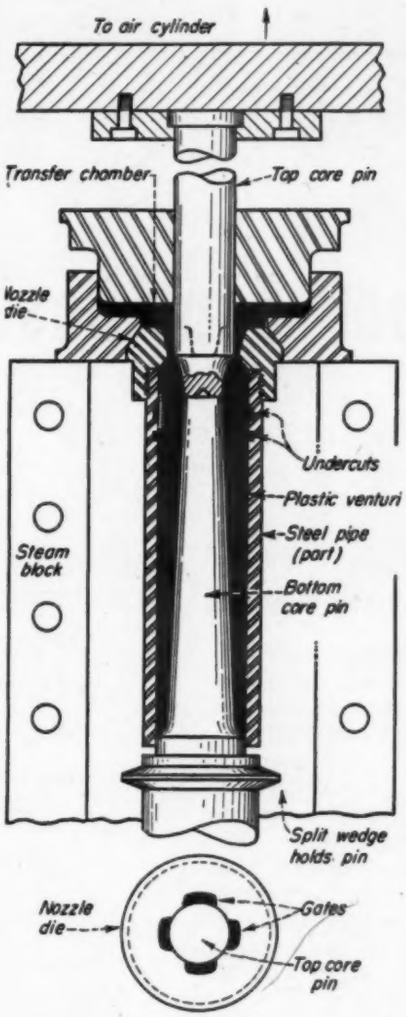
TRANSFER MOLDING of plastic parts has been directly responsible for much of the industrial plastic applications in the metalworking industry. Production of venturi for deepwell pumps manufactured by Flint & Walling Manufacturing Co. at Kendallville, Ind., was increased and costs reduced by application of transfer-molding methods. Tooling and molds were developed and produced by the Plastics Division of General Electric at its Fort Wayne plant to put the job on a practical production basis.

The large size of the pipe used as a casing for the plastic material and the length of the core pin inside the casing posed the major tooling problem. Transfer molding made it possible to provide the necessary flow without extreme ram pressure. The only finishing operation required is removal of the gates by sanding and removing the burr where the top and bottom core pins meet.

Each deep-well system of this type uses two pipes, one conducting water from the pump to the bottom of the well (below water level) where the water is forced through a nozzle close to the small hole in the venturi. The low-volume, high-velocity water coming from the nozzle causes high-volume, low-velocity water to flow through the venturi and upward through the second pipe to the pump. On reaching the pump a small portion of the water thus raised is recirculated to the bottom of the well while the remainder passes into the storage tank.

Venturis were formerly made of cast brass and required machining of threads on both ends and machining of the hole through the tube. This operation, a difficult and costly one, is eliminated by molding. A slight increase in efficiency was noted because of the smooth surface finish of the thermosetting plastic material. Cost of the plastic venturi is approximately 50% that of the former brass casting.

To prepare the steel pipe for moldings, it is cut off smooth and square at the threaded end so a threaded molded component can be screwed to it. The other end is bored to a smooth hole of uniform size because the variation in diameter and roughness of standard pipe would not allow a close fit for the mold core pin.



NOZZLE DIE is designed to act as a semi-ring gate which is easily sanded off after molding cycle. The venturi pipe is undercut in two places to strengthen the bond between plastic and metal and prevent any slipping of the plastic insert

A 98-ton press supplied the pressure for the 3-platen transfer mold. The mold itself was of novel construction because it was necessary to extend the top core pin through the transfer chamber. The part is then gated with a semi-ring gate around this center core pin.

Split-wedge type molds are used and it is necessary to assemble the split wedge, bottom core pin, pipe and threaded ring outside of the mold. The assembly is placed in position and the top core pin is moved downward by an air cylinder attached to the top knockout bar, actuated by an air cylinder. This supports the bottom core pin to prevent deflection. Asbestos-filled phenolic compound is then placed in the transfer chamber and the mold is closed.

Molding compounds chosen had to meet two rigid requirements. Minimum water-absorption characteristics were necessary because the part was constantly immersed. Low shrinkage was required so the plastic would not be too loose in the pipe. Undercut rings were machined in each pipe to prevent the plastic from sliding in the pipe. Without these rings, a sudden impact might break the bond between the rough pipe and the plastic.

The pipes were preheated before molding, about 20 to 30 F. higher than the mold, to give expansion for a resulting better bond with the plastic and to compensate somewhat for the shrinkage of the plastic material.

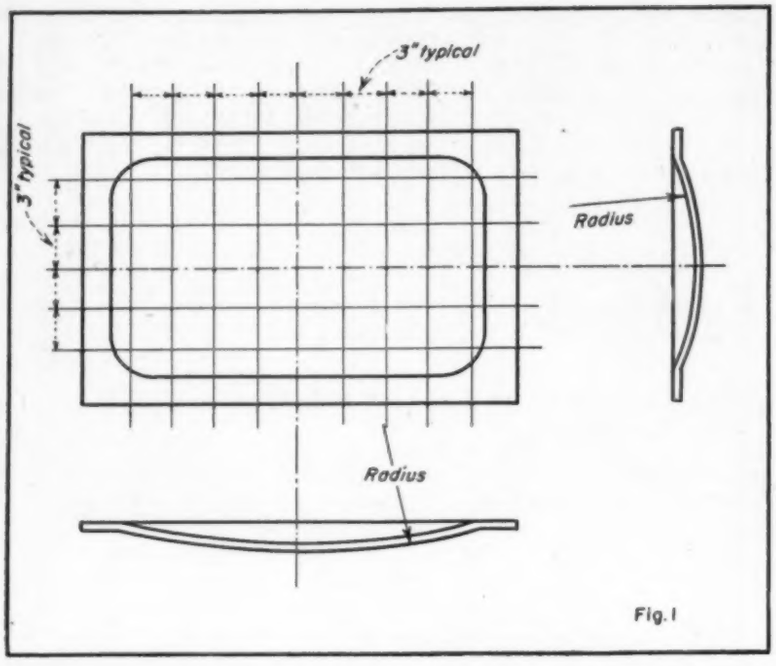


Fig. 1

REFRIGERATOR inner-door panels are double-curvature surfaces having true vertical and horizontal radii. Tool designing requires cross-sectional views at 3-in. intervals in both vertical and horizontal planes

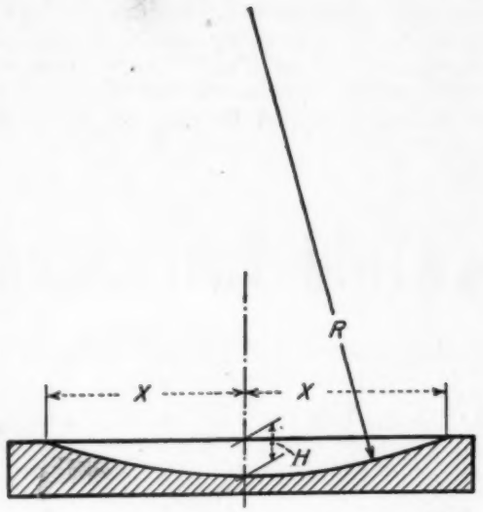


Fig. 2

DRAWING cross-sectional views, as of this male half of mold, requires calculation of dimension *H* from *X* and *R* values by use of approximate formula: $H = X^2 \div 2R$

Refrigerator Door Tool Design Simplified

BY G. M. BLEAKLEY
MICARTA DIVISION, WESTINGHOUSE ELECTRIC CORPORATION

Making mold drawings can be simplified and speeded up by approximately the true dished surfaces

DESIGNING mold drawings for refrigerator inner-door panels is being done at the Micarta tool-design department with comparative ease by applying an approximate arithmetical formula, accurate in use to +0.0000,—0.0008 in.

General shape of the panel is rectangular with the center dished to conform with true vertical and horizontal radii. In designing the tooling, mold cross-sectional views must be drawn at the vertical and horizontal center lines. Additional section views located at 3-in. intervals call for many dimensions that can be found quickly by using the formula: $H = X^2 \div 2R$. This formula is an approximation of the true formula: $H^2 - 2RH + X^2 = 0$, wherein H^2 has been discarded as negligible because X values are so much greater than H values.

Thus, when $R = 400$ in. and $X = 23$ in.,

$$H = \frac{X^2}{2R} = \frac{23 \times 23}{2 \times 400} = 0.6612 \text{ in.}$$

When H and X are known, R can be calculated. For an H value of 0.5625 in. and X of 15 in.,

$$R = \frac{X^2}{2H} = \frac{15 \times 15}{2 \times 0.5625} = 200 \text{ in.}$$

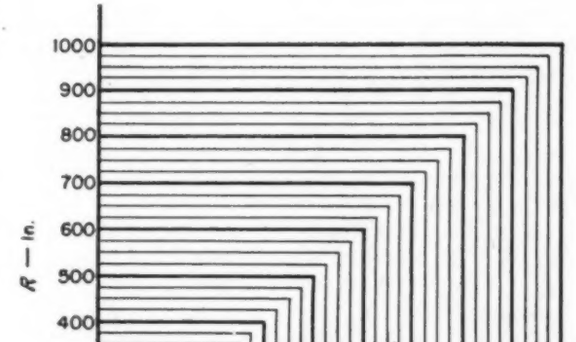
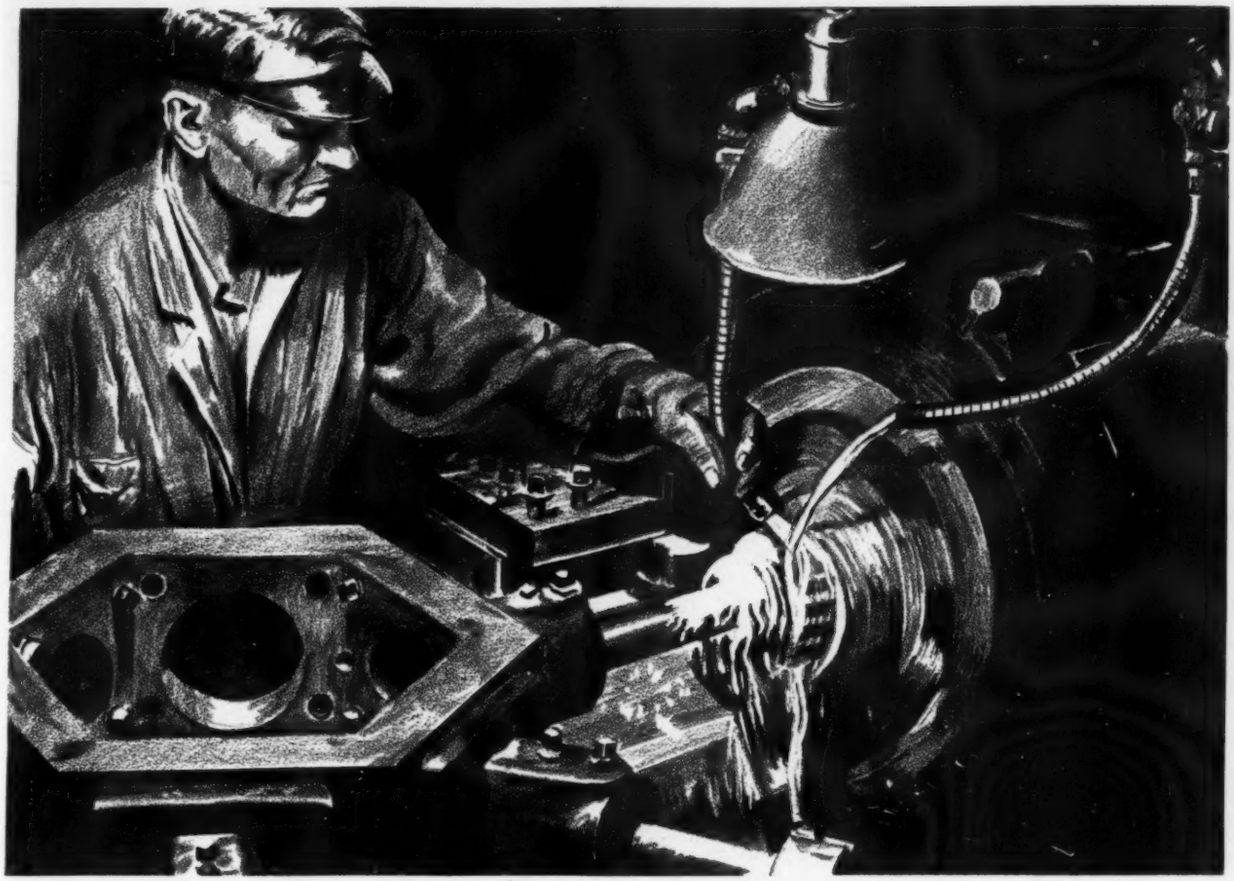


Fig. 3

FORMULA ACCURACY depends on limiting the values of *X* and *R*. This partial chart shows the maximum values of dimension *X* and radius *R* wherein the formula is accurate to +0.0000, —0.0008 in.



HOW TO WORK WITH

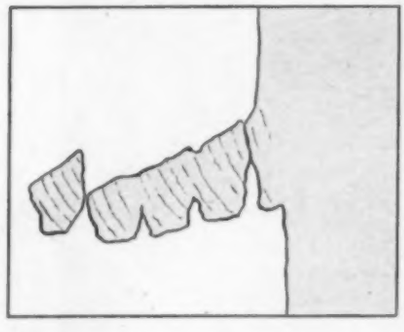
Cutting Fluids

BY HAROLD L. FLYNN, ASSOCIATE EDITOR

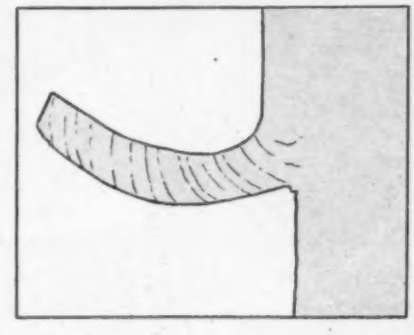
It has been common practice in the past to consider carefully such factors for a machining job as the machine tool, the cutting tool, the material to be cut and the operator—and then pay scant attention to selection and application of cutting fluids. Happily that period is past and the trend today is to a careful and even scientific approach to selection of cutting fluids. Longer tool life, better finish, less downtime and higher speeds are considered vitally important today and the role of cutting fluid is better understood. There is a definite trend at this time to buy cutting fluids on performance alone, rather than on cost and specifications. It is recognized that the ingredients in a cutting fluid do not determine its performance—but the manner in which they are used and operation to which they are applied do. While performance and the cooperation of production men, metallurgists and cutting oil engineers must still be the basis of diagnosis, the following pages covering action, characteristics, application and handling of cutting fluids will be a safe guide for conventional machining and other operations.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

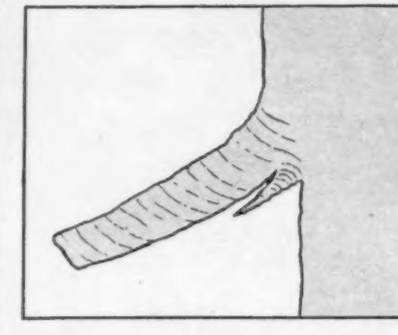
THREE TYPES OF CHIPS



DISCONTINUOUS CHIPS, or segmented chips, have the initially compressed layer passing off with each segment. This type of chip is easily disposed of and results in good surface finish



CONTINUOUS CHIPS have continuously escaping compressed layer adjacent to the tool face. This is a good chip from the point of view of finish, tool temperature and power consumption



CONTINUOUS CHIPS may also have built-up edges adjacent to the tool face. Finish is rough because of fragments of built-up edge escaping with the work. Solution is to reduce friction

Cutting-Fluid ACTION

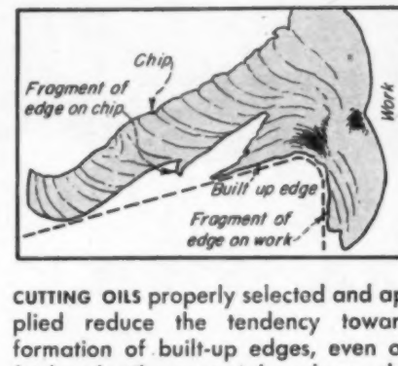
CUTTING FLUIDS have four major functions, cooling, lubricating, rust prevention and flushing. When cutting or grinding operations generate heat, cutting fluid carries the heat away by (a) cooling the tool to prevent loss of temper and to reduce abrasion, (b) cooling the work to reduce distortion and (c) cooling the chip and reducing the power required to break the chip.

The lubricating quality of a cutting fluid involves film formation and distribution or viscosity factor, film adhesion or "oiliness" and chemical activity to form a surface film of metallic compound or an E.P. (extreme pressure) anti-weld factor. The effect of these combined factors is to reduce friction between the tool, work and chip. An E.P. agent may also prevent welding of freshly cut metal to the work and minimize alteration of the tool shape by a built-up edge.

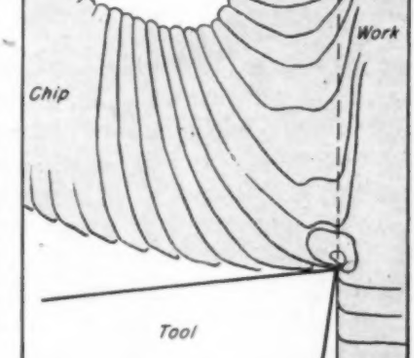
Contingent upon these main factors, the cutting fluid must protect the machine and the work against rusting and other types of corrosion. It should also wash away metal particles and chips or grinding residue. This is particularly important in abrasive cutting (grinding and honing) and in deep-hole drilling, hacksawing and milling.

Chip Formation

Nature of the machining operation often indicates which function of a cutting fluid is the most important. The best cutting fluid is the one which is outstanding in the particular qualities demanded by that operation. Chip formation, by its very nature, becomes an important gage of cutting-fluid requirements.



CUTTING OILS properly selected and applied reduce the tendency toward formation of built-up edges, even on fairly ductile materials where this problem is most frequently encountered



CONTOUR of flow or strain lines suggested as explaining the basis on which chip formation develops. Lines of chip structure no doubt result from plastic deformation along strain lines

Chip formation itself is affected in certain respects by metal characteristics. The amount of compression which the metal undergoes governs the length of the chip segment, which in turn depends on the ductility of the metal and its relative strengths in compression and shear. Displacement of the chip may occur by rupture of individual large elements or by rupture or crumbling of small elements as with cast iron and other brittle metal. It may also occur by plastic flow (slip of successive elements without rupture) as with steel and other ductile metals which form a long continuous chip.

High friction between chip and tool, particularly with ductile metals, usually causes portions of the chip to adhere to the face of the tool; the result is a built-up-edge. This edge protects the tool point but causes surface roughness on the part.

Conditions which result in a discontinuous or segmented chip are brittle material, thick chip (deep cut), low cutting speed and a small rake angle of tool. This type of a chip produces a minimum of sliding friction on the face of the tool and is disposed of most easily. Tool failure usually occurs by abrasive wear on the cutting edge and on the flank between the tool and the work. Cooling rather than lubrication is required of the cutting fluid because it maintains the abrasion-resistant qualities of the tool. Two other types of chip —both continuous—are commonly encountered and closely related, one being the result of low, the other the result of high, sliding

friction on the tool face. The latter type, characterized by a built-up edge, may be changed by a reduction of any of the conditions contributing to friction. Heat is thus reduced and better surface finish and tool life encountered. This preferable type of continuous chip may result from conditions such as ductile material, small chip thickness, high cutting speed, large rake angle, keen cutting edge, maximum temperature at the tool point, high polish on the tool face, carbide-tipped tools or an effective cutting fluid.

Both lubrication and cooling are important in maintaing this type of chip formation. Soluble oils and low-viscosity mineral oils have sufficient lubrication for many operations. Cutting oils high in E. P. qualities are better for heavier cuts, tougher metals and less-favorable tool conditions. Carbide-tipped tools offer an exception, and soluble oils provide maximum cooling with adequate lubricity at high speeds.

Tests with extreme-pressure-lubricant machines show clearly the importance of sulphur in oils as an antiweld or antiseizure agent. It is easy to see how such agents reduce welding tendencies between the heavily loaded surface of chip and tool, giving better finish and tool life. The function of chlorine compounds and other agents is not so well known, but it can be observed that friction and resulting temperatures are reduced when they are present.

It has been noted that, because of the comparative inaccessibility of the cutting orbit, the volume of the coolant in immediate contact with the areas where the temperature is generated is not sufficient to accomplish much. Principal cooling must be done by conduction from the hot spots through the cooler parts of the tool and workpiece.

Cutting-Fluid TYPES

CUTTING FLUIDS most widely used today may be grouped under the general headings of straight mineral oils, mineral lard oils, sulphurized mineral lard oils, sulphurized mineral oils and soluble oils (emulsifiable oils).

Straight Mineral Oils—These oils are suitable for light machining operations on certain steels, brass and for more difficult operations on the white metals. They combine both cooling and lubrication to meet moderate requirements, and are often used in automatics under conditions where an emulsion might cause trouble by dilution.

The greatest use for a straight mineral oil today is as a blending medium mixed with a base cutting oil having higher lubricating value for more critical operating conditions. Where the straight mineral oil is selected it should be obtained from the relatively low-viscosity grades. More viscous oils require additional draining time, carry heat away more slowly and separation from chips and foreign matter will be slower.

Straight fatty oils have been used widely in the past, but are rapidly being replaced by synthesized oils, or are blended to some degree with mineral oils. However, many companies have moved away from them entirely and have substituted other coolants for lard oils. This avoids the tendency toward rancidity or "Monday morning odor" commonly encountered after weekend shutdowns. Greater control of manufacture and stability is also possible.

Mineral Lard Oils—One of the widest use of this type of oil, a blend of mineral oil and fatty oil, is for automatic screw machines where a better surface finish is required than could be obtained with straight mineral oils. They are also suitable for machining copper and its alloys because of their non-corrosive characteristics although improved tool life may be obtained by using sulphur cutting oils containing free or added sulphur.

Lard oil, No. 1 or prime lard, is the most commonly used additive although blends containing other fatty oils are still referred to as mineral lard oils, even those containing synthetic fatty oils. Percentages of fatty oils in such blends vary from 10 to 40%, with the higher percentages being used for work of higher hardness or where deeper cuts are required.

The adaptability of these oils to tool cooling and lubrication is explained by the fact that they have a good degree of oiliness and may be obtained in low viscosities. This accelerates the heat-transfer rate and promotes separation from chips and foreign matter.

The objections to lard-oil blends are tendency towards rancidity, possibility for bacterial growth and skin infection and a possibility that the work will be glazed in machining the tougher alloys.

Sulphurized Oils—The development of sulphurized oils was a major step in cutting-fluid technique in the field of general lubrication. When added correctly to mineral oils or mineral lard oils, sulphur increases their cooling and lubricating characteristics. Sulphurized oils can also penetrate smaller crevices than lard or fixed oils. This, plus added film strength, gives better surface finish with the toughest steels.

Sulphurized oils are generally classified in three groups as:

(a) Animal or vegetable oils with cooked-in sulphur.

(b) Sulphurized mineral oils, consisting of straight mineral oil in which the active sulphur content is not usually more than 3%. This oil is used as prepared, but may be blended further with a light mineral oil for certain types of work.

(c) Sulphurized base oils, which include a fatty oil to which is added from 8 to 20% active sulphur commonly known as a sulphur base. The base is then diluted to approximate cutting strength and viscosity by blending with 5 to 20 parts straight mineral oil for fairly low viscosity (about 110 Saybolt at 100 F.).

These latter two sulphurized oils are used for machining straight-carbon or alloyed steels, stainless steels and high-nickel alloys. The soft stringy steels call for a high sulphur content, while the steels which are harder and more brittle require less sulphur. Broaching, threading and tapping require high-sulphur oils. Drilling, reaming, shaping, turning, milling and hobbing require low-sulphur oil.

Highly sulphurized oils are not suitable for machining brass or nonferrous alloys because of the active nature of the sulphur, which often turns these metals black.

Soluble Oils—Where cooling is more important than lubrication the soluble oil is invaluable as a medium for transferring heat from a cutting tool. Such a coolant, containing a relatively high percentage of water, is applicable to a wide variety of operations. Water is an ideal coolant because of its high specific heat and thermal conductivity, but without the soluble oil it would cause rusting of the machine parts and even the machine itself.

Emulsions formed from soluble oils

range in appearance from a clear translucence to a pure opaque milk white. Often the cooling characteristics of such an emulsion, containing a high amount of water, are emphasized without realizing that the formation of a foam blanket lowers their cooling characteristics below that of straight oils at temperatures above the boiling point of water.

Emulsions are 3-phase systems consisting of an inner phase, a middle protective phase and an outer phase. Most soluble oils form oil-in-water emulsions in which the inner phase is oil, the protective phase a soap and the outer phase soap-in-water solutions.

Generally, the outer phase governs the physical behavior of an emulsion, but it appears that the inner phase of the emulsion is released in some way to provide a measure of lubrication. The oil in the inner phase may be anything from a straight petroleum to a straight fatty or other cutting oil; performance of the emulsion varies accordingly. Soaps in the protective and outer phases affect the detergency, heat dissipation and rust-inhibiting characteristics of the mixture.

To attain good lubricating value in emulsions, it is necessary to use soluble oils capable of forming stable emulsions with either warm or cold water and remaining stable under continued usage. They must also be free from mineral acids, have no disagreeable odors and contain no ingredients injurious to the workman's hands. The emulsions should also show no tendency to gum or clog mechanisms of machine tools.

When used as grinding coolants, emulsions should be able to settle the grinding dirt rapidly, ensuring long emulsion life, free-cutting grinding wheels, surface finishes free from scratches, minimum surface structural changes and uniform circulation of the emulsion.

Emulsions for grinding are usually much leaner than for machining operations and may reach a ratio of one part of oil to 50 to 70 parts water, while the turning emulsion may range from one part oil to 10 parts water, to as much as one part oil to 30 parts water.

Cutting-Fluid SELECTION AND APPLICATION

SELECTION of any cutting fluid is most properly made at the point where the work is being done and performance tests are recommended wherever possible. Factors such as cost, personal preference, cutting speeds, tool hardness, tool design, machinability of the work and type of operation will be considered, but performance tests give the absolute conditions to be encountered.

Recognition of the principal differences between cutting fluids is also valuable in making a selection. Sulphurized mineral oil, for instance, will be good for many cutting operations on tough ferrous metal, and are widely used for threading operations. Because of corrosive action they are not recommended for cutting brass or non-ferrous alloys. When, in certain cases, they are used, it is necessary to remove tarnish.

Sulphur-base cutting oils are useful for machining operations where visibility of the work is important. Development of high-grade transparent, active, sulphur-type oils has been speeded up during the war years; today there is a decided preference for transparent oils in all precision or exacting work.

Mineral oil, lard oil, mineral lard oil and other such fatty-acid mineral-oil combinations are often useful for cutting high-carbon steels at relatively low speeds. They sometimes are substituted for soluble-oil emulsions where emulsions might be corrosive to the work or the machine parts. Soluble-oil emulsions are used for grinding to provide high cooling action and prevent distortion of the piece. Recent practice, however, employs oil as a grinding medium for many operations previously served by emulsions. A mineral insoluble oil is widely used for thread grinders and on internal grinders. Advantages cited are better finish, lower production cost, increased wheel life, and ability to grind more complicated forms. It is claimed that grinding speeds can be doubled and tripled through the use of an oil of this type. Precautions must be taken against oil mist washing out greases in the locating and pressure rolls on grinders.

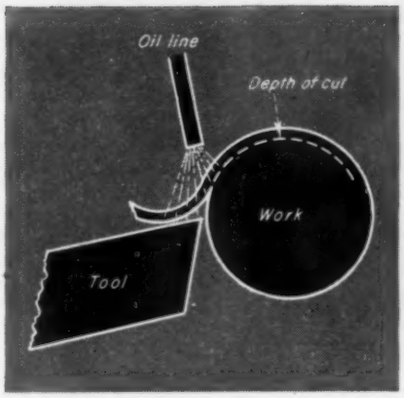
Principal factors to consider in choosing emulsions or coolants vs. mineral-type fluids are: (1) Cooling needs of work and machine. (2) Lubrication required at point of application. (3) Required stability and service life. (4) Operation requirements regarding finish on work, production rate and tool life. (5) Effect of fluid on working parts of machines. (6) Physiological effects on operators. (7) Operator preference. (8) Economy with regard to initial costs, operating costs, maintenance and recovery and reuse.

Emulsion-type coolants or fluids have superior cooling qualities and may possess considerable lubricating value if compounded with sufficient proportions of fatty oils, fatty acids and mineral oils. Chemical activity can be imparted by adding chemically active agents such as sulphur, chlorine, phosphorus and other compounds. Care must taken with these formulations to avoid undesirable secondary products as a result of combination with water.

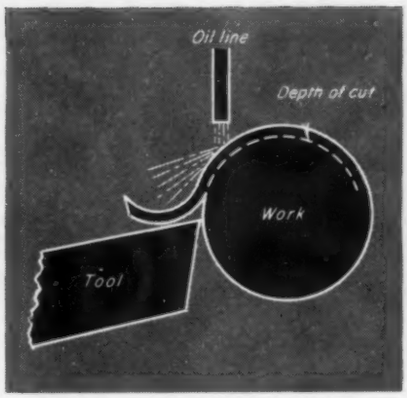
Both conventional and heavy-duty soluble oils may contain foam depressants, rust preventives, germicides, water-softening agents and other additives to improve their performance. Emulsion coolants are not generally recommended for use in automatic screw machines or similar tools. Leakage of the emulsion into spindle bearings from ineffective bearing seals may result in displacement of the spindle lubrication and subsequent seizure and damage.

The grinding process requires certain properties in the fluid, including: (1) Suitable wetting out action to insure a continuous film on the work. (2) No tendency to form gums or resins in use or load the grinding wheel. (3) Settle chips, dirt, grits, etc., readily in the settling tanks to avoid carryover and scratching of the work. (4) Resistance to rusting even in very dilute emulsions. (5) No tendency to affect the bonding material of the wheel.

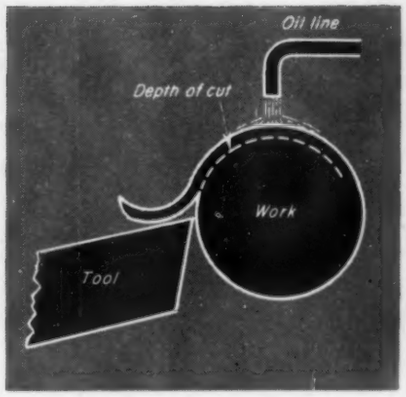
The cutting edge of a metallic tool is accurately shaped and maintained in a definite relationship with respect to the work. The face is designed to facilitate chip disposal, and the rubbing surfaces may be polished to improve lubrication conditions. The cutting edges of abrasive grains however may be presented to the work at any angle, the paths of chip flow are indeterminate, and smooth surfaces conducive to lubrication are absent. Conditions are not



CUTTING FLUID piped to the tool and work in this manner will, under most conditions, give adequate cooling and lubrication to the tool and work



DIRECTION of cutting fluid in this manner will cause deflection from the work and prevent the medium from reaching the actual cutting point



NEITHER the tool nor the work will be adequately cooled and lubricated by directing the flow at this point of the work. Little fluid will reach the tool

favorable to lubrication in the usual sense, and the cutting fluid in most grinding operations principally cools, flushes and prevents rust. However, as noted, oil as a grinding medium is gaining ground and performance tests may indicate many valuable applications.

Soluble oil, one part to 50 to 100 parts of water, is the most widely used emulsion, giving with treatment opaque or translucent emulsions. Paste-type compounds of a high-soap type are used to some extent in preparing coolants for grinding. If fatty oil is added, care should be taken to avoid an excess as it may contribute to wheel loading, gumming and prevent satisfactory chip settling. Paste-type compounds are usually mixed with several parts of water, preferably hot and agitated to produce a heavy slurry, then diluted with 70 to 150 parts of water.

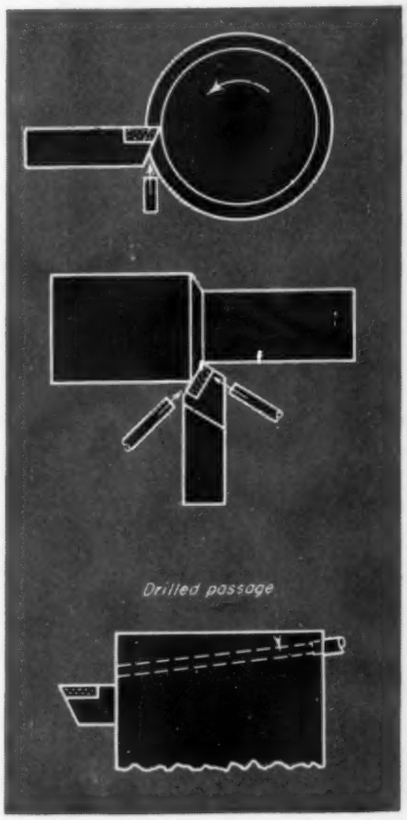
Light mineral oils are used when less severe cooling is required, as in the case of metals which may develop surface cracks when quenched too rapidly with a water emulsion. Light mineral oils or kerosene are also used for their lubricating qualities in precision-grinding aluminum and its alloys. Light oils with good oiliness characteristics are used for various grinding operations on hardened materials.

When the proper selection of a cutting fluid is made effective, means of directing it to the point of application must be insured. In general, cutting fluids should be applied in large quantities at the highest velocity possible without undue splashing. They should be applied directly on the tool point where the chip is being formed. From 3 to 5 gpm. for each single-point tool is effective. Fluid should flood the tool before the start of the cut and be applied continuously during the cut, particularly when carbide tools are being used.

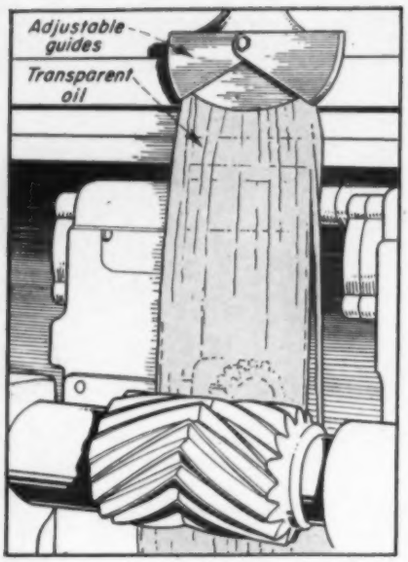
A spreader-type discharge should be used with wide forming tools to insure flooding the full length of the cutting edge, as any rapid change in temperatures will affect the tool. Application of cutting fluid when machining steel with carbide tools can employ a ⅜-in. diam. feed pipe, and the cutting fluid may be piped from underneath the tool. Increased secondary clearance should be provided to help cutting fluid reaching the cutting edge. The fluid may also be piped from both sides of the tool or the tool block may be drilled to form a passage for the cutting fluid, thus permitting an unobstructed flow to the nose of the tool. In at least one case, cutting fluid has been passed through a thin tube being worked, to provide a stiffening action as well as cooling.

The method of applying the cutting fluid in grinding is highly important because of the high precision requirements. Here it is important to maintain a high cutting-fluid rate for adequate cooling, a uniform rate to minimize temperature variations and a high-velocity jet to penetrate the "windage" and apply the fluid at the point of cutting. A high-velocity jet not only applies the cutting fluid at the point where it is most effective in controlling the temperature but it also provides maximum flushing of fine grindings and assists in preventing wheel loading. Cutting fluid has been successfully applied through an open-structure wheel, centrifugal force aiding the flushing.

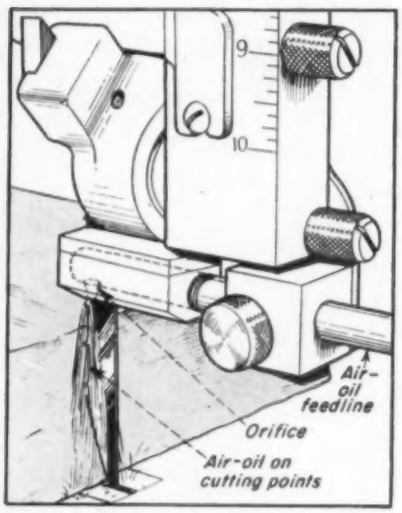
Machine tools not equipped with circulating systems may have the cutting fluid applied by drip can, oil can or brush. The cutting-fluid rate using the drip method may be sufficient to give some cooling and a soluble emulsion is sometimes used. The other two methods provide negligible cooling effect and best results are obtained with oils having high viscosity, oiliness and E.P. characteristics. Very little actual metal cutting is being done by



THREE METHODS for applying cutting fluid to carbide tools are by piping it from underneath the tool point, piping it from both sides, or drilling a hole through the tool block directing the flow to the tool nose



PIPE LINES may be fitted with special orifices to control the width and depth of cutting-fluid flow, particularly applicable to such operations as cutting herringbone pinions. The use of a transparent cutting oil in this type of cutting gives a good view of the work



AIR-OIL FOG lubricators are being used more extensively for cutting operations. The air-oil mixture is piped from the lubricator under pressure to be released through an orifice onto the cutting point

these methods and today automatic high-pressure systems are rapidly replacing older equipment.

Increased use is now being made of automatic spray lubricators in many metal-cutting operations such as sawing, tapping, drilling and reaming. An air-oil mixture or an emulsion is forced under suitably high pressure to the point of cut in the form of a fog. Units may be made up which are automatic and either continuous or intermittent.

MACHINABILITY RATING—FERROUS METALS

	Group No. 1 Machinability Rating, % 70 to above 100	Group No. 2 Machinability Rating, % 55 to 70	Group No. 3 Machinability Rating, % 35 to 55
Carbon Steels	SAE 1010 1015 1020 1022 1025	SAE 1035, 1040, 1045	SAE 1050 1055 1060 1066 1070 1080 1085 1095
	AISI C-1010 C-1015 C-1016 C-1020 C-1022 C-1025	AISI C-1035 C-1040 C-1045	AISI C-1050 C-1055 C-1060 C-1066 C-1070 C-1085 C-1095
Free-Cutting Sulphurized Steels	SAE 1112 1113 1117 1132 1137		
	AISI B-1112 B-1113 C-1117 C-1132 C-1137		
Molybdenum Steels	SAE 4023	SAE 4027 4032 4119 4125 4037 4042 4130 4137 4615	SAE 4042 4047 4063 4068 4140 4145 4150 4320 4340 4620 4640 4820
	AISI 4023	AISI A-4027 A-4032 A-4119 A-4125 A-4037 A-4042 A-4130 A-4137 A-4615	AISI A-4042 A-4047 A-4063 A-4068 A-4140 A-4145 A-4150 A-4320 A-4340 A-4620 A-4640 A-4820
Manganese Steels		SAE 1330 1340	
		AISI A-1330 A-1340	
Nickel Steels		SAE 2317	SAE 2330 2340 2345 2515
		AISI A-2317	AISI A-2330 A-2340 A-2345
National Emergency Steels		NE 8024 8124 8233 8245 8339 8624 8630 8720 8739 8817 9415 9420 9425	NE 8442 8447 8744 8749 8949 9430 9440 9450
Iron	Malleable		
Nickel-Chromium Steels		SAE 3120 3130	SAE 3135 3140 3145 3150 3240 3310
		AISI A-3120 A-3130	AISI A-3135 A-3140 A-3145 A-3150 A-3240 E-3310
Chromium Steels		SAE 5120 5140	SAE 5150 52100
		AISI A-5120 A-5140	AISI A-5120 A-5140 E-52100
Chromium-Vanadium Steels			SAE 6130 6150
			AISI A-6120 A-6145 E-6150
Silicon-Manganese Steels			SAE 9260
			AISI A-9255 A-9260
Stainless Steels		SAE 30615 Type No. 2 X-51410	SAE 30615 Type No. 1 30705 30805 30915 30905 51210 51310 51335 51710
		AISI 303 304 308 309 310 316 317 416 430-F	AISI 301 302 321 347 410 414 420 430 431 440 441 446

Machinability rating is relative, being based on machining SAE 1112 under normal conditions as 100%

CUTTING—FLUID APPLICATION

OPERATION	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Broaching (Roughing) up to 1" Broach	20:IM, E-3, B, J-2	15:IM, E-3, B, J-2	10:IM, H, E-1, D	10:IM	15:IL, A, N, B	15:IL, A, B, C	10:IL, B, C, I	N
Broaching (Roughing) over 1" Broach	15-IM, E-2, B, J-2	15:IM, E-1 E-2, B, J-3	10:IM, G-1 G-2, D-1, I	10:IM	15:IL, A, N B, I	15:IL, A, B	10:IL, C, J-1, I	N
Broaching (Finishing)	E-2, B J-3	I, G-1, D-1	I, G-2, G-1, D-2	10:IL, N	15:IL, A, N, B	15:IL, A, B, J-2, I	10:IL, C, J-2, I, D-1	N, J-1
Broaching Heavy duty	G-2, H, D-2	G-2, H	G-2, H	10:IM, N J-2	15:IL, A, B D-2	15-IL, A, B, D-2, I	10:IL, C, J-	N, J-1
Die Threading—Tapping	E-2, E-1, C J	E-1, G-1, D J-1	G-2, D-2 I	10:IM, N	15:IL, A, N, C, J	10:IL, A C, J-2	10:IL, C, J-2, I	N, J-1
Pipe Threading Automatic Tapping Machines	E-1, G-2, D-2	G-1, G-2 D-2	G-2, D-2		15:IL, A, N, C, J	10:IL, A, C, J-2	10:IL, C, J-1, I	N, J-1
Gear Shaving	G-2, G-1, C, I	G-2, G-1, C, N	G-2, G-1					
Gear Cutting	E-3, C, J	E-2, B, C, I, J	G-1, E-2, D-1 C, B, I		A, N, B, J	A, N, B, J	J-2, I, C D	N
Reaming	15:IM, E-2 E-1, B	10:IM, E-2 B, J-1, G-1	10:I, G-2, D-1, C, I	20:IM	15:IL, A, N J-1	15:IL, A, B, J-1	10:IL, A, B, C, J-2	N
Drilling	20:IM, E-3, B, J-1	15:1M, E-2 B, J-1	10:IM, G-1 D-1, J-2	20:IM	15:IL, A, N J-1	15:IL, A B, J-1	10:IL, J-2 I, J-1	N
Hobbing				20:IM				N
Boring	20:IM, E-3 B, J-1	15:IM, E-2 B, J-1	10:IM, G-1 D-1, J-2	20:IM	15:IL, A, N J-1	15:IL, A B, J-1	10:IL, J-2 I, J-1	N
Milling	20:IM, E-3 B, J-2	15:M, E-2 B, J-2	10:IM, C-2 D-2, J-2	20:IM	15:IL, A, N, J-2	15:IL, A B, J-2	10:IL, J-2 I, J-1	N
Shaping	30:IM, E-3 B, J-1	30:IM, E-3 B, J-2	30-IM, E-3 J-1, I	20:IM	15-IL, A, N J-1	15:IL, A N, J-1	10:IL J-1 I, D-1	N
Turning	30:IM, E-3 B, J-1	30:IM, E-3 B, J-2	30-IM, E-3 J-1, I	20:IM	15-IL, A, N J-1	15:IL, A, N, J-1	10:IL, J-1 I, D-1	N
Cold Sawing High Speed	30:IM, A E-3	30:IM, A E-3	20:IM, A E-3		20:IL, A N	20:IL, A N	20:IL, A, N, J-1	N
Cold Sawing Low Speed	10:IM, A, E-3, B, J-1	10-IM, A E-2, B, J-1	10-IM, A, E-2, B, J-1	20:IM	20:IL, A, N	20:IL, A N	20:IL, A J-1, J-2	N
Grinding—Plain	50:IL A	50:IL A	50:IL A	30:IL A	50:IL N	50:IL N	50:IL N	N
Grinding—Farm Thread, etc.	K-1, K-2	K-1, K-2	K-1, K-2	N	K-1, J-2	K-1, J-2	K-1, J-2	N, J-2 K-2

Metals Designations—Group 1—(Steel, 70-100 machinability); Group 2—(Steel, 55-70 machinability); Group 3—(Steel, 35-55 machinability); Group 4—(Cast Iron); Group 5—(Copper Base Alloys, 80-100 machinability); Group 6—(Copper Base Alloys, 50-70 machinability); Group 7—(Copper Base Alloys, Machinability below 50); Group 8—(Aluminum and Magnesium)

Key to Fluids Recommendation —

A—Straight mineral oil

B—Mineral lard oil, 10% lard oil

C—Mineral lard oil, 40% lard oil

D-1 and D-2—Transparent active sulphur oil, in ascending viscosity and compounding

E-1, E-2 and E-3—Dark active sulphur oil viscosity range 110 to 250 sec. Saybolt at 100 F, mild types

G-1 and G-2—Dark, active sulphur oils, heavy duty, compounded with lard oils

H—Dark active sulphur oil, heavily compounded, for severest operations

I—Non-corrosive transparent oil, equivalent to lard oil of 40 to 100% concentration

J-1, J-2 and J-3—Non-corrosive transparent oil, with petroleum-base substitute for lard oil, Viscosity and compounding increasing

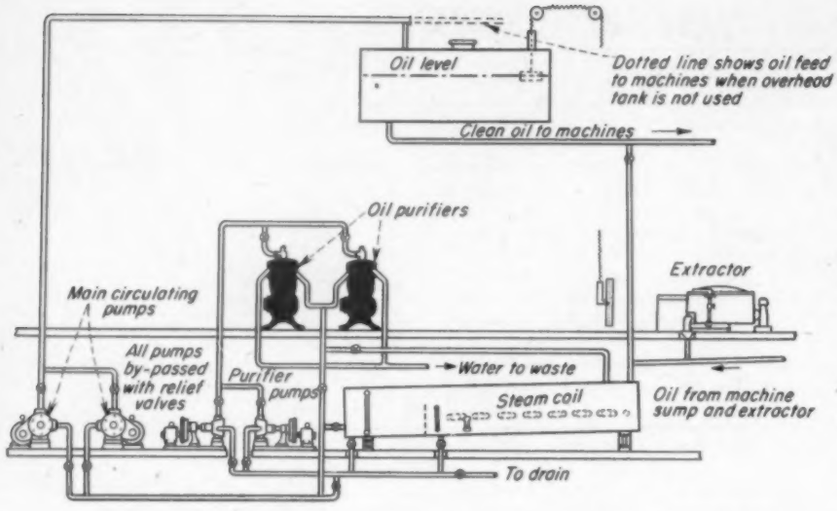
K-1 and K-2—Thread grinding oil, 160 and 300 sec. Saybolt at 100 F viscosity, non-corrosive and transparent

L—Soluble oil, grinding type (Ratios indicated)

M—Soluble oil, cutting type (Ratios indicated)

N—For Aluminum and Magnesium, transparent and odorless

Note—If in the machining of copper-base alloys, sulphur-base oils are required, stains on parts should be removed by soaking them in a 5-10% solution of sodium cyanide. Alternate recommendations are given in the table and selection will be based finally on severity of operation and performance tests



CUTTING FLUIDS maintain their highest cutting efficiency when filtered and purified on a continuous basis through a central system. Where consumption is not high enough to warrant central-system operation, it is still good economy to try a localized method of reclamation

Cutting-Fluid HANDLING

CARE OF CUTTING FLUIDS begins with storage. Contamination with water, grit or other impurities should be avoided. The safest procedure is to store cutting fluids in a separate building, or at least in an enclosure in the shop. Interiors of tanks or receptacles should be thoroughly cleaned after prolonged usage and kept clean.

Temperature changes will not affect the quality of most cutting fluids, but extreme changes of temperature will in time impair the oils and cause separation of ingredients put in for better cutting.

In large plants it is most efficient and economical to distribute cutting fluids with a central system. However, where such a system is not justified, the oil may be mixed at the machine if precautions are taken to keep all mixtures uniform and free from contamination. Regardless of the system used, identification of the fluids should be positive so the proper oils will go the proper machines.

Reclamation—To maintain cutting fluids in their intended state, steps must be taken to guarantee proper reconditioning or reclamation. Metal-cutting fluids can be readily purified or filtered after contamination in service. This is most important in production shops, machine shops and toolrooms where fluids are being used constantly and where cutting efficiency must be high.

Cutting fluids should not be discarded after they have been used for some time because re-usage is practically an economic necessity. The perforated plate or wire mesh usually installed in the base of the machine is effective in removing most of the larger chips. However, to assure maintenance of quality, more elaborate equipment is necessary.

Reconditioning equipment may involve a centrifugal chip extractor and oil purifier or a chip-settling tank with a suitable oil filter. The oil may be delivered from the machines by hand or truck and treated periodically, or suitable piping can be installed for continuous purification. The amount of oil used, location of the machines and the rate of contamination will determine what type of equipment will be justified.

Reconditioning offers other advantages besides lower operating cost. Cutting tools receive maximum protection when the oil is kept constantly free of chips, scale and dirt. Power consumption is noticeably reduced. Tools do not require as frequent sharpening and grinding, and less downtime is involved. Oil temperatures are also reduced, and better cooling and lubricating is obtained from the cutting fluid. Oxidation, acidity and gumming are also retarded. With proper reconditioning measures in effect, a higher grade of oil can be justified, and sludging can be prevented.

Dermatitis—In handling of, and exposure to, cutting oils, danger from dermatitis is always present. Dirt, along with cutting fluids, has a tendency to plug pores and hair follicles and form blackheads. The natural oil secreted by the skin and the bacteria normally found on the skin accumulate under the blackheads and sets up an irritation which eventually develops into postular eruptions or pimples.

All petroleum oils have the property of defatting the skin, which may cause cracking and fissuring and make infection imminent. Mechanical injury to the skin from minute particles suspended in cutting lubricants or from metal slivers or chips from wiping rags may lead to infection. Preventive measures against dermatitis include washing frequently with mild soap, avoiding the use of harsh, abrasive soaps or cleaning solvents, frequent laundering and the use of protective creams. Individuals who have become infected should be isolated from others.

Boils or skin infections should be treated with sterile dressings and a suitable antiseptic lotion such as boric acid. Dry types of infection may be treated with an ointment of boric acid or zinc oxide. Workers with hand infections should be removed from machines until cured.

WE ACKNOWLEDGE *Information contributed by the following companies made possible the preparation of this special report:*

American Society for Metals
Carboloy Company, Inc.
Cimcool Division of Cincinnati Milling Machine Co.
Cities Service Oil Company
Fiske Bros. Refining Company
Gulf Oil Company
E. F. Houghton & Company
Norton Company
Shell Oil Company
Socony-Vacuum Oil Company
Standard Oil Co. of California
Standard Oil Company of Indiana
D. A. Stuart Oil Company, Ltd.
Sun Oil Company
Swan-Finch Oil Corporation
Texas Company
Tide Water Associated Oil Company

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TALKING SHOP

Be Unexpected

LETTERS HOME to workers have frequently been advocated on these pages. In a discussion at the recent AGMA meeting, several companies reported such letters had been major factors in explaining the facts to the little woman, and in staving off drastic action. *Caution:* Hold the letters for times when they are really needed. Regular mailings soon result in lack of readership . . . Be sure the letters are well and simply written. . . . Don't get high and mighty, pedantic or argumentative.

Relative Portability

PRESSURE VESSELS are now usually rolled from heavy plate, then automatic-welded and rolled again for circularity. M. W. Kellogg Co. has found it easier and quicker in many cases to bring the welder to the vessel rather than the other way around. Multiple beads are laid to avoid "tree" effects except in the outer bead. The final inner bead may be deposited by an extension-arm welder, but the others are put down by a carriage-type automatic unit.

Small Tools

WELL-MANAGED tool and die shops now charge off as purchased all perishable tools (including grinding wheels) and shop supplies. At year-end, an inventory is taken, and partially used tools are shown in inventory at remaining value (cost or current market, whichever is lower). Anything used up in a year is classified as perishable, according to National Tool & Die Mfrs. Assn.

Visual Education

JOHN HOMEWOOD sends us the cover from a vocational and high-school shop magazine showing a youngster at a lathe. Both toolholder and toolpost wrenches are in place, says John, "to deflect the annoying chips or convince the instructor he (the boy) knew where the wrenches belonged." Makes us feel better about the occasional sarcastic comment we get about an illustration, reconvinces us of the importance of editing photographs — somehow — as closely as text, and reminds us of the toolpost wrench we had to weld because a chuck jaw caught it. The real poignancy in the last instance was that we couldn't weld very well, so the foreman broke the first two welds after we'd ground them smooth.

Hot Tip

HOT PIERCING a transmission-gear blank, said Harold Inch of Ford, at the AGMA meeting, permits broaching of the bore and gives more even distribution of fiber structure about the axis than a drilled blank does. Greater cost in forging is more than offset by savings in machining and material. Shorter and smaller-diameter bars can be used, cutting material cost 25%, time from 10 to 50%—if design allows most efficient gear cutting.

Carbide Gears?

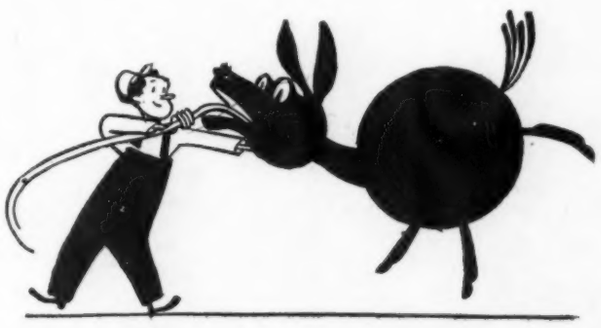
PHIL MCKENNA predicted use of carbide gears and pinions, particularly the latter, at the AGMA meeting. He suggests carbide pinions to equalize pinion and gear wear in high reduction ratios, for carbide outlasts steel as much as 200 to 1. Another suggestion was use of a carbide shaft for a H.S.S. knurl. Such a pin can withstand knurling pressure better than steel and has a lower coefficient of thermal expansion, so overheating of the tool increases running clearance in the bearing.

Inspect Before

GEAR LAPPING can be reduced on transmission gears, according to an AGMA speaker, by having Inspection check the machining setup before parts are run, then have the Gear Laboratory check parts whenever the machine is adjusted. Keeping records of adjustment will indicate when machine or fixture needs maintenance or repair—and avoid extensive spoilage.

Mule Handling

IN A machine-repair department, according to J. A. Raught, a man was trying to replace the candle wicking in the crooked oil tubes of the inner side of the turret lathe. Another worker came along and asked, "What are you trying to do?" The answer, "I'm trying to poke a shoe string down the throat of a stubborn mule." At that, the visitor wadded up one end of the candle wicking and shot it through with a blast from an air hose. "That is the way," he said, "to handle a stubborn mule."



Furnace requirements will depend on the number, nature and weight of assemblies to be brazed. Cost can be reduced by selection of proper atmospheres and good heating equipment

LOADING TRAYS in hand-operated pusher type furnaces receive the material to be brazed and it is manually pushed through the heating and cooling chambers and manually extracted. This type of equipment is used for experimental rather than production brazing operations

CONTINUOUS FURNACE BRAZING . . 3

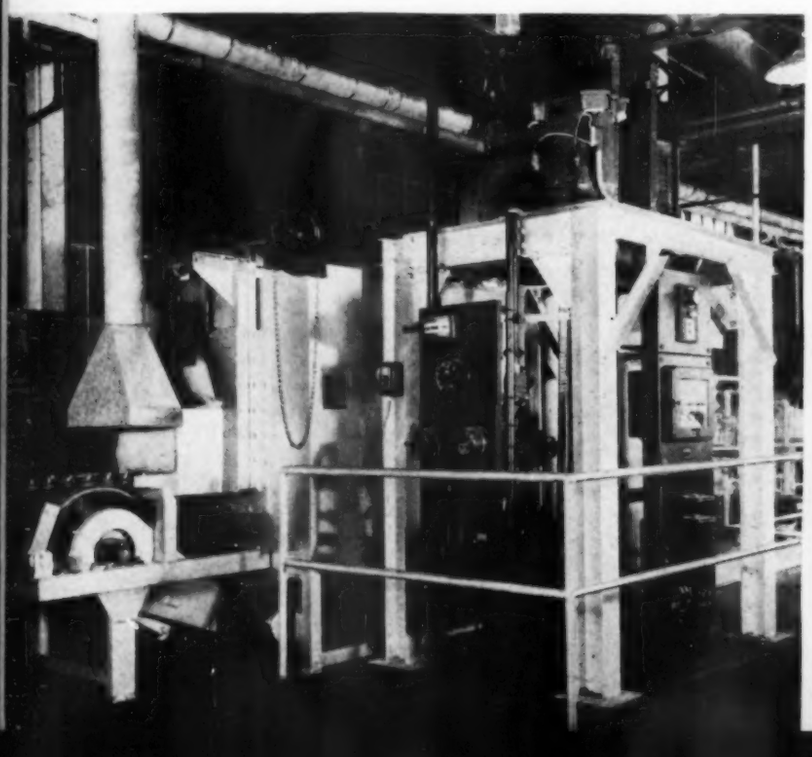
How to Select and Operate Furnaces

BY C L. WEST, VICE PRESIDENT,
THE ELECTRIC FURNACE COMPANY

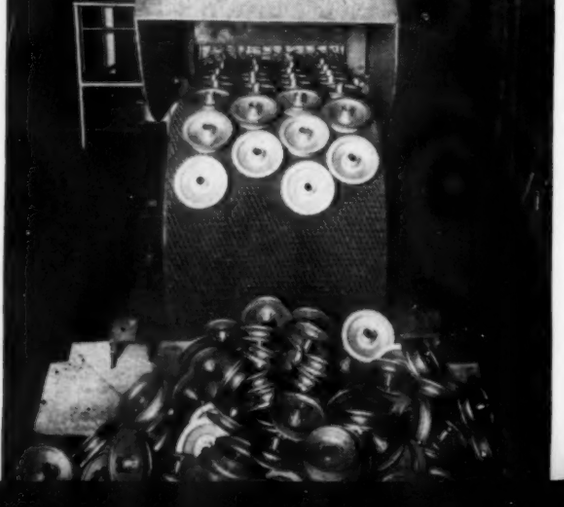
FURNACE BRAZING of industrial assemblies currently employs four types of furnace, the hand-operated pusher, mechanically-operated pusher, wire-mesh belt-conveyor and the roller-hearth conveyor. Of the four, only the hand-operated type is unsuitable for production operation and is generally installed for experimental operation to determine practicality of brazing assemblies.

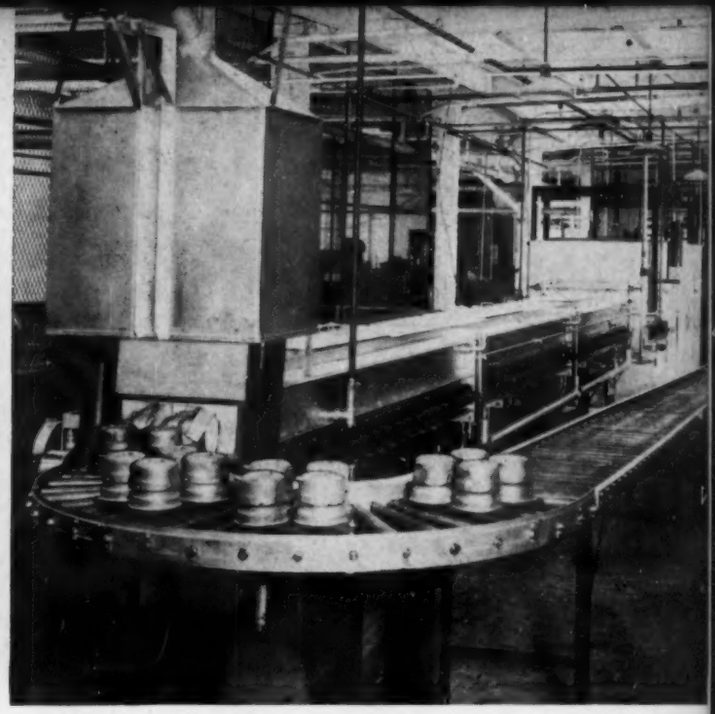
Mechanically operated pusher furnaces were the first to be used successfully in a through-furnace brazing operation but are impractical where assemblies to be brazed are light in weight. Economic operation is possible where the weight of the assemblies to be brazed is quite high, thus providing a favorable ratio of net to tare weight to be heated.

Wire-mesh belt-conveyor furnaces are practical for the brazing of small and medium assemblies, and under favorable loading conditions will give net production of 175 to 500 net



WIRE-MESH belt furnaces are particularly adaptable to flat assemblies such as these generator pulleys. Assemblies are discharged to a large tote box. Weight of assemblies through the furnace at high temperature is a limiting factor, although strength of the wire mesh may be suitably varied





ROLLER-HEARTH FURNACES may be arranged for operation by one man, as in the copper brazing of fittings into domes for hermetically sealed compressors. A return conveyor is used, including a driven return bend, to return finished assemblies to the loading end and adjacent to the operator's station

lb. per hour. A limiting factor in this type of furnace is the stress on the wire-mesh belt conveyor at elevated temperatures, and other types of furnaces should be considered where articles with heavy loading density are involved.

In the roller-hearth type of furnace, assemblies of parts are universally handled on comparatively light heat-resisting alloy trays for a large variety of assemblies. Trayloads of assemblies are generally prepared on a roller-hearth extension in front of the furnace chamber or charging vestibule.

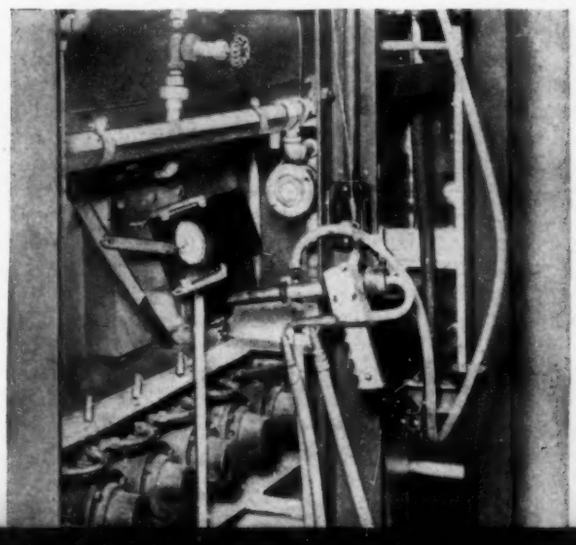
Furnace atmosphere may be adequately maintained in this type of furnace for relatively high loads of material requiring large furnace openings. Trayloads of material may be readily separated, the lightweight vestibule door opened by hand cranking or mechanically, and rolls may be operated at high variable speed to place the charge within the vestibule without unnecessarily 'influencing the atmosphere. The same procedure is possible at the discharge end of the cooling hood.

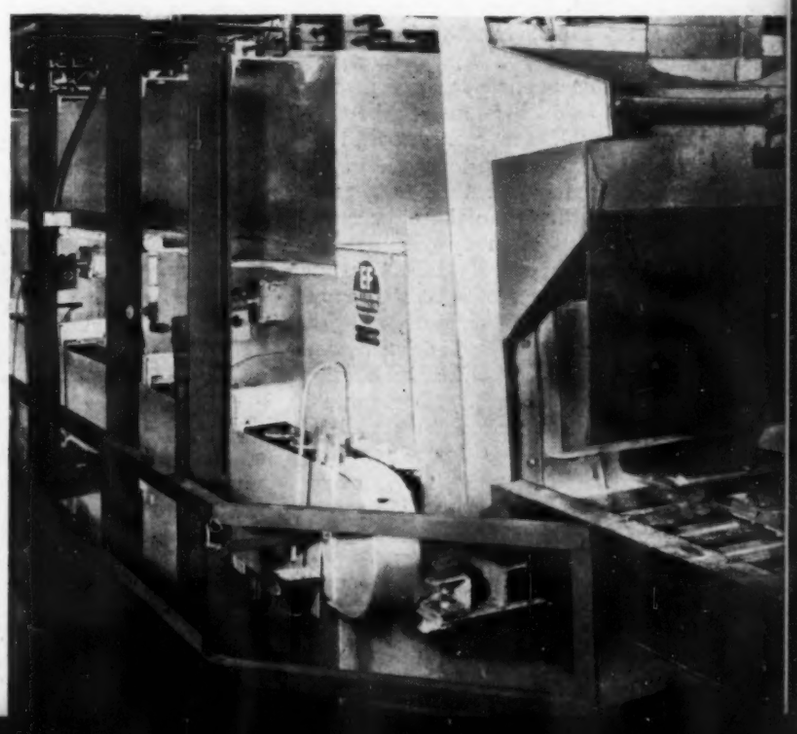
Heating Methods

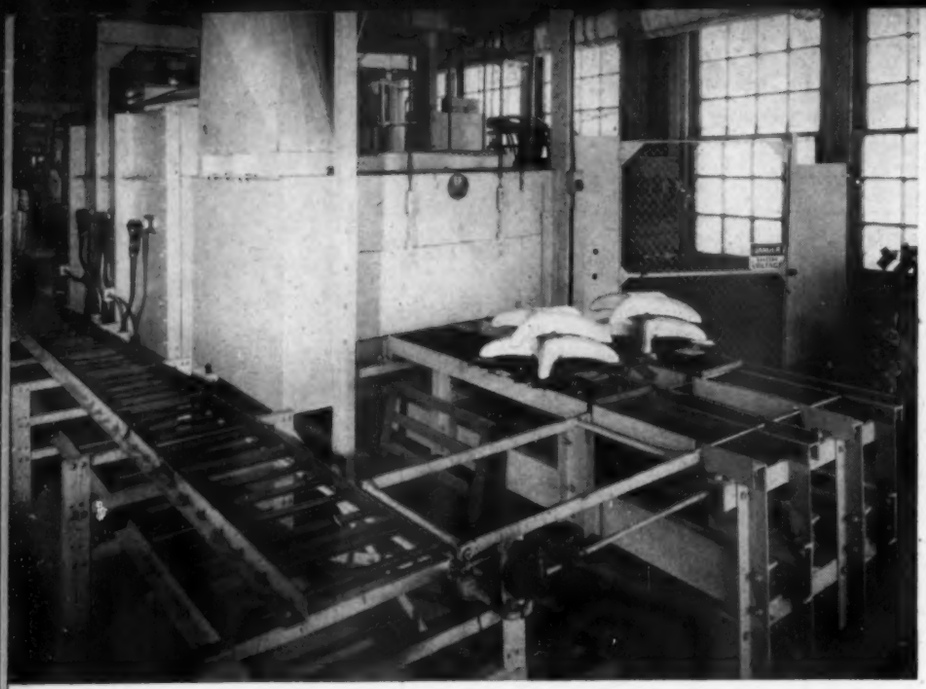
Brazing furnaces operated at temperatures up to 2100 F. are usually equipped with electric-resistor heating elements, normally mounted in the roof and side walls of the furnace chamber. They are purposely omitted from the bottom of the heating chamber to eliminate possible leakage of copper onto heating elements. Where such leakage is not likely, heating elements may be mounted in the roof and bottom of the chamber for better distribution and heat transfer to assemblies and fixtures.

Furnaces operated in the lower temperature ranges may be heated with gas-fired radiant tubes, and in the future a certain number of furnaces operated up to 2050 F. may be constructed with gas-fired radiant-tube heaters where it is more eco-

STEEL EVAPORATORS, shown entering a roller-hearth furnace, may be brazed by the vacuum process. Brazing foil is laid between the evaporator sheets and, as it goes through the heating chamber an operator inserts a vacuum nozzle and draws the sheets together

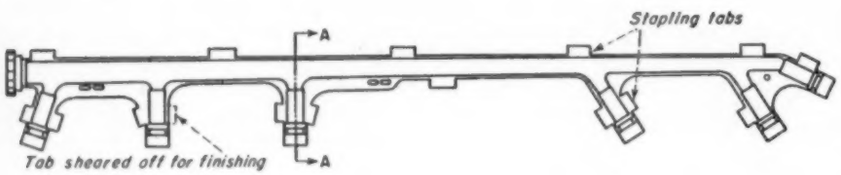






ALUMINUM BRAZING EQUIPMENT, although more specialized than that required for other metals, is still versatile. The equipment, shown here brazing an assembly of parts to form the base of a swivel chair, was originally developed for brazing and heat-treating the tubular type conduit unit below. The conduit unit is made of sheet aluminum of the bimetal type, formed in halves as shown in the cross-section. Halves are attached by stapling through the tabs and fittings inserted in the various outlets, with the union fitting loose on the assembly after brazing. Doors of three chambers in the furnace open simultaneously and pawl-bars extending through the equipment advance assembly trays forward in each station. The material may be brazed in the first station, equalized at solution treating temperature in the second chamber and forcibly cooled with air in the third

Section A-A



nomical to use low-cost fuel than electric heat.

Furnaces utilizing brazing media of low melting point, particularly in the brazing of non-ferrous assemblies such as diaphragms for thermostatic control equipment, should be of roller-hearth type for rapid insertion of material into the heating chamber rather than the slow progress of advancing into the chamber on a belt conveyor. Heating elements or radiant tubes should be above and below the work for more uniform temperature distribution. Sidewall heat should be avoided in heating thin-gage non-ferrous parts for silver soldering, when a uniform heat across the hearth is desirable.

In an application where a furnace is built especially for brazing non-ferrous materials with silver solder and similar brazing media, the equipment could be direct gas-fired by utilizing a premix system for controlling air-gas ratio and a large volume circulation of furnace atmosphere to obtain uniformity across the hearth level.

Reducing Atmosphere Utilized

Furnace atmosphere for brazing should be reducing in character, and except for their high cost, hydrogen or dissociated ammonia (75% hydrogen, 25% nitrogen) are highly preferred. However, for simple low-carbon steels in the assembly, a simple and inexpensive atmosphere is produced by partial combustion of natural gas, coke-oven gas, butane, propane, kerosene oil or other carbonaceous materials.

In this method of gas preparation, an atmosphere containing relatively small amounts of hydrogen, carbon monoxide, carbon dioxide, with the balance nitrogen, is produced. It is sufficiently reducing in character to provide bright finishes on steel assemblies. This gas is reducing to iron and copper oxides at brazing temperatures and usually ranges in cost from 10 to 50 cents per thousand cu. ft., depending upon quantities produced and the cost of raw materials for production of the gas.

One gas equipment setup consists of a lined combustion chamber, pumping equipment for delivering air and gas to the combustion chamber, metering equipment for metering the flow of the air gas mixture and a surface cooler for partial dehydration of the gas. Endothermic gas-cracking equipment, producing a gas rich in hydrogen and carbon monoxide provides a good atmosphere for minimizing decarburization on high carbon parts or any parts where carbon dioxide is objectionable.

Brazing Aluminum Alloys

Brazing of aluminum parts is accomplished in air, and no special-atmosphere equipment is required. Assemblies are normally made from stampings and castings of heat-treatable aluminum alloys. On simple assemblies, the brazing medium may be aluminum wire, rod or sheet, but in more intricate assemblies sheet-metal parts of the assembly are bimetal, in which the base is a heat-treatable alloy and the surface of aluminum forms the brazing medium.

Temperature uniformity is essential because overheating causes extreme action of the flux, attacking the parent metal, and underheating will cause failure from improper melting of the brazing medium.

Aluminum brazing furnaces are electrically heated and incorporate fans and directional-flow baffles for circulating large volumes of heated atmosphere over the work. Atmosphere returns behind baffles and past the heating elements for reheating. This arrangement provides uniformity of temperature in the assembly.

A considerable number of furnaces have been placed in operation for aluminum-brazing heat-exchanger assemblies such as oil coolers. In this more difficult type of heating, uniformity is attained through circulation of a considerable volume of air directly through the assembly. Further special provisions are made to prevent overshooting the desired brazing temperature toward the end of the cycle. Generally speaking, the successful aluminum brazing of metal assemblies requires that practically every application receive special detailed consideration.

This concludes Mr. West's series.

HOW TO DESIGN CARBIDE DRAW DIES

BY EARLE GLEN

CARBIDE DIE ENGINEER, CARBOLOY COMPANY, INC.

SHEET METAL in many analyses, and in light and heavy gages, has been drawn and formed successfully with Carboloy dies for ten years. The two most important advantages of these dies, it has been found, is an important increase in die life—some 20 to 30 times that of steel dies on the average—and a better finish on the work. The better finish frequently eliminates considerable buffing and polishing otherwise required.

During this time, the principles in handling cemented-carbide inserts in die construction have been proved by service. It has been learned that, in general, the best procedure in designing a new die is to duplicate a steel die that has given good service on the same job. There are some differences, however, as will be discussed farther on. If there is any question about an entirely new design it may be good insurance to make a steel "tryout" die first and then—if satisfactory—duplicate it in carbide.

The main thing to remember about designing carbide die sections is this: the hard carbide nibs cannot be drilled or machined. The designer therefore should always keep in mind the necessity of laying out die sections that can be finished by grinding (that is, sectional construction, where necessary).

Fortunately, with Carboloy nibs it is not necessary to allow excessive stock for grinding. The manufacturer of cemented carbides is able to produce preformed sections with relatively small excess stock for grinding.

In the trade, these preformed die parts are called nibs and nib sections. Carboloy die nibs can be furnished in virtually any shape. As a general rule, carbide nibs for round-hole dies are furnished in the form of rings; nibs for square and hexagonal holes can also be solid, but like nibs for irregularly shaped openings are normally supplied in split sections or segments to permit finishing.

Recommended practices in designing carbide draw dies are in detail:

Draw Radius R, Fig. 5, is generally identical with that for steel dies (usually four times stock thickness).

Bearing Length L, Fig. 6, can be shorter than for steel dies because of longer carbide die life, thus reducing die cost. Good bearing lengths for different bearing diameters are:

Diameter From		To	Length of Bearing
0	to	½	⅛
½	to	1	3/16
1	to	1¼	¼
1¼	to	2	5/16
2		up	⅜

Back Relief, Fig. 7, should be liberal as a precaution against the possibility of flaking of the carbide at bottom of the bearing.

Nib Diameter D, Fig. 8, is determined by the wall thickness *W*, plus bearing diameter.

A good guide is:

Bearing Diameter From		To	Wall Thickness
0	to	½	5/16
½	to	1	⅜
1	to	2½	½
2½	to	5	⅝
5 and up			¾

For nibs of unusually large *bell opening*, the O.D. of the nib can be taken as the bell opening plus ⅜ in. on diameter, Fig. 9.

Nib Height H, Fig. 10, is determined by the sum of draw radius, bearing and back relief, and may be somewhat less than for a comparable steel die because of the shorter permissible bearing length.

Cupping Die Nibs, Fig. 11, should have O.D. larger than the blank diameter to provide proper wear surface. If this is not feasible the entire die case should be hardened or a hardened steel wear ring should be attached to the top of the die. If these precautions are not observed, excessive wear of a soft case may occur long before the carbide develops any appreciable wear.

Bottoming Dies, Fig. 12, should be designed so that the carbide nib ex-

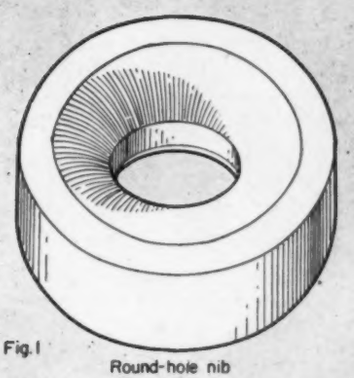


Fig. 1 Round-hole nib

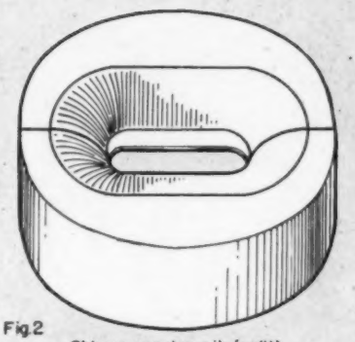


Fig. 2 Oblong-opening nib (split)

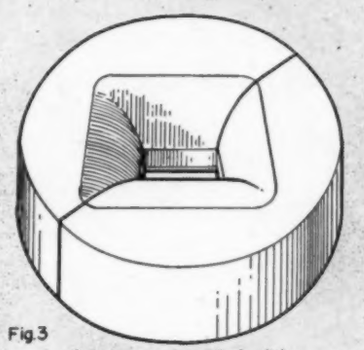


Fig. 3 Square opening nib (split)

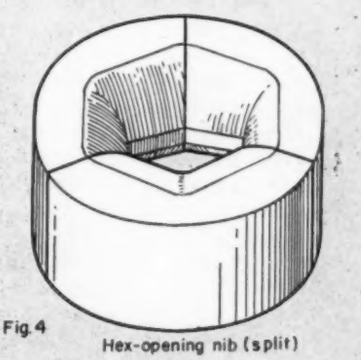
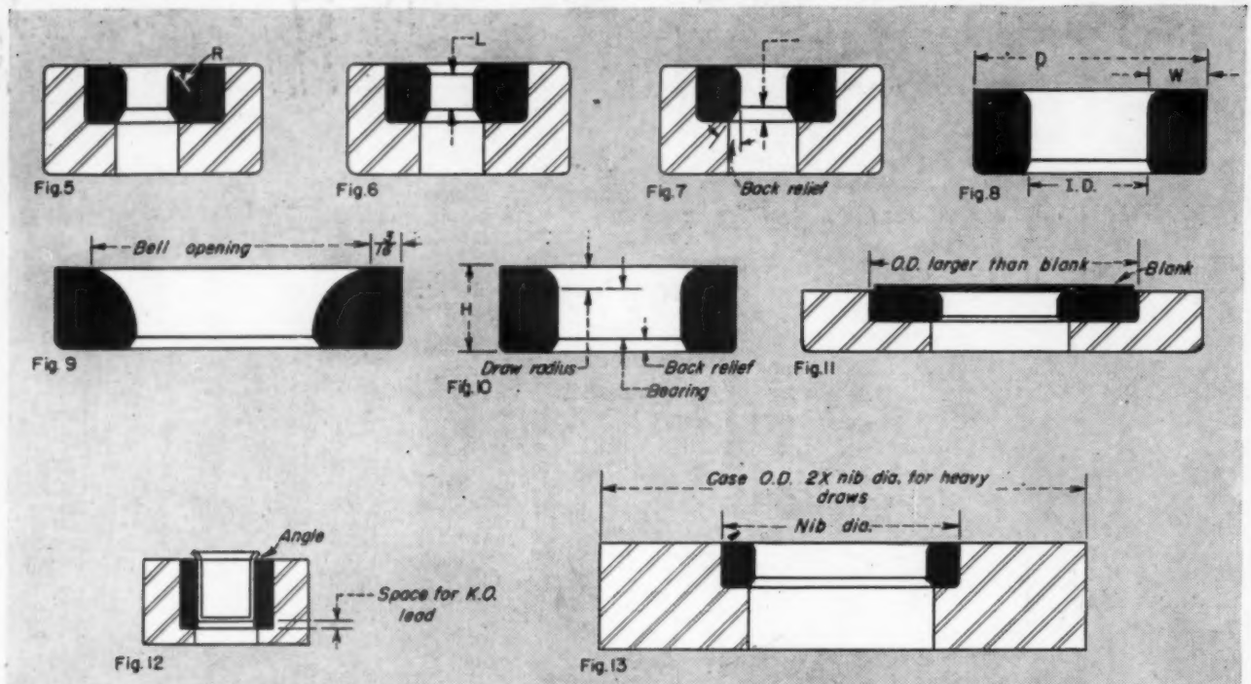


Fig. 4 Hex-opening nib (split)

DRAW DIE NIBS are made solid or split according to the problems involved in grinding the opening



DIMENSIONS of draw-die nibs depart in some particulars from those used for steel dies

Table I—Manufacturing Tolerances on Carboloy Preformed Nibs (Solid and With Holes)

Dimension From—To	Tolerance on O.D. and Length	Tolerance I.D.	Stock Allowed For Finishing On I.D., O.D. & Length
0.010— 0.019		+.000—.003	.008
0.020— 0.049	+.010—.000	+.000—.005	.008
0.050— 0.099	+.010—.000	+.000—.008	.008
0.100— 0.199	+.010—.000	+.000—.010	.010
0.200— 0.399	+.015—.000	+.000—.015	.010
0.400— 0.599	+.020—.000	+.000—.020	.015
0.600— 0.799	+.025—.000	+.000—.025	.015
0.800— .999	+.030—.000	+.000—.030	.015
1.000— 1.249	+.035—.000	+.000—.035	.020
1.250— 1.499	+.040—.000	+.000—.040	.020
1.500— 1.749	+.045—.000	+.000—.045	.020
1.750— 1.999	+.050—.000	+.000—.050	.020
2.000— 2.249	+.055—.000	+.000—.055	.025
2.250— 2.499	+.060—.000	+.000—.060	.025
2.500— 2.849	+.070—.000	+.000—.070	.025
2.850— 3.249	+.080—.000	+.000—.080	.025
3.250— 3.649	+.090—.000	+.000—.090	.030
3.650— 3.999	+.100—.000	+.000—.100	.030
4.000— 4.499	+.110—.000	+.000—.110	.040
4.500— 4.999	+.120—.000	+.000—.120	.040
5.000— 5.499	+.130—.000	+.000—.130	.040
5.500—18.000	+.140—.000	+.000—.140	.040

Maximum stock to be removed for finishing the Carboloy nib is the stock allowed for finishing plus the maximum tolerance.
Minimum stock to be removed for finishing the Carboloy nib is the stock allowed for finishing.

tends below the cup to provide a wear-resistant lead for the knockout.

Die Casings

Cases for Heavy Draws, Fig. 13, such as for "ironing" steel cups, should have an O.D. at least twice that of the nib. This construction provides ample support for the nib.

Assembling

Segmental draw dies are generally assembled by shrink fitting. Table II is a guide for the shrink fit to be allowed in the casing of Carboloy nibs. For shrink fit dies, SAE 4340 steel is recommended. This should be hardened to Rockwell C38-42. Since it takes less time to finish grind steel than carbide, it is good practice to finish the I.D. of the case to "fit the nib." And since there are no oxides on the surface of Carboloy blanks, it is not necessary to remove more than a "skin" coat to obtain a good finished surface. Figs. 14, 15 and 16 show details of assembly.

Relieve the steel case prior to assembly, Fig. 17, if the carbide nib and the case are to be ground in the same setup after assembly. This practice will keep the diamond wheel used for grinding the carbide from touching the steel and loading up.

Solid carbide nibs can also be

pressed into a steel case. In this assembly method, the case I.D. and the nib O.D. should be in accordance with force-fit tolerances and allowances given in the American Standards Association Bulletin B4a-1925.

Although wear on draw punches is usually not as severe as on draw dies, there is nevertheless a trend toward use of Carboloy punches for drawing, due to their extremely long life. Of course, it is frequently possible, if punch wear is light, to use steel punches with carbide draw dies to reduce the cost of the dieset.

Three kinds of attachment are used for carbide punch nibs:

Screw-Attached Punch Nibs, Figs. 18 and 19, are most commonly used. If a capscrew head will not interfere with function of the punch face, a drilled and counterbored hole can be preformed and the nib attached as shown in Fig. 18. The shoulder on the opposite end of the nib serves to locate it in the steel punch backup to avoid shifting. However, if the punch face must be continuous and smooth, and the nib is large enough, the construction in Fig. 19 is recommended. The carbide is provided with a machinable insert which is readily drilled and tapped by the diemaker. This method can be successfully applied to practically any type of punch.

Brazed Punch Nibs, as in Fig. 20, are sometimes used on light work but are not recommended for "general" use. For added support, with brazed assemblies, the rear end of the carbide nib can be tapered to fit into a conical hole in the body.

Carbide punches and dies must be accurately aligned in the dieset and extra care is required to see that the press bed and ram are in alignment.

Table II—Shrink Fit Allowances For Carboloy Nibs

Nib Range O.D. From	Under	Shrink Allow.
0.437	0.562	.0013—.0018
0.562	0.687	.0016—.0021
0.687	0.812	.0021—.0026
0.812	0.937	.0025—.0030
0.937	1.125	.0028—.0033
1.125	1.375	.0035—.0045
1.375	1.750	.0038—.0048
1.750	2.000	.0043—.0053
2.000	3.000	.0045—.005
3.000	3.500	.0055—.006
3.500	4.000	.0065—.007
4.000	5.000	.007 —.008
5.000	6.000	.008 —.009
6.000	7.000	.009 —.010

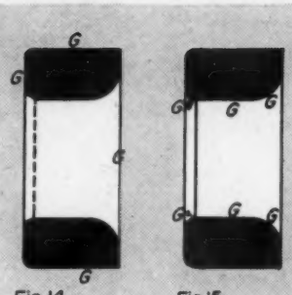


Fig. 14 Fig. 15

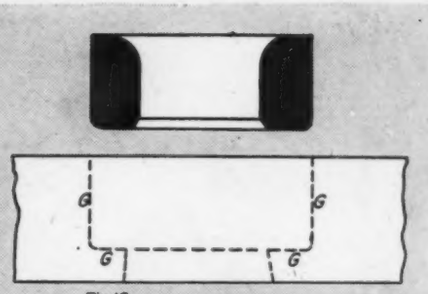


Fig. 16

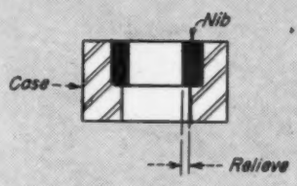


Fig. 17

ASSEMBLY of draw dies is normally done by press or shrink fitting the carbide nib into the steel case

STEPS IN ASSEMBLY

1. Grind O.D., top and bottom of nib to clean up, Fig. 14.
2. Rough grind die opening to within 0.005 in., Fig. 15.
3. Grind I.D. and bottom of opening in case, Fig. 16, to correspond with nib dimensions, allowing for a shrink fit (Table II) or a press fit.
4. For a shrink fit, heat the case to 700 F., drop in place, and press to assure bottoming.
5. Finish-grind the nib opening.

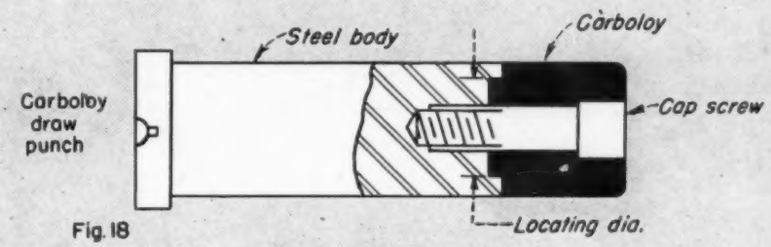


Fig. 18

Fig. 19

Carboloy draw punch

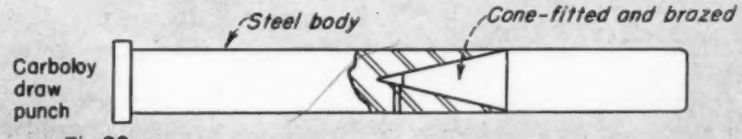
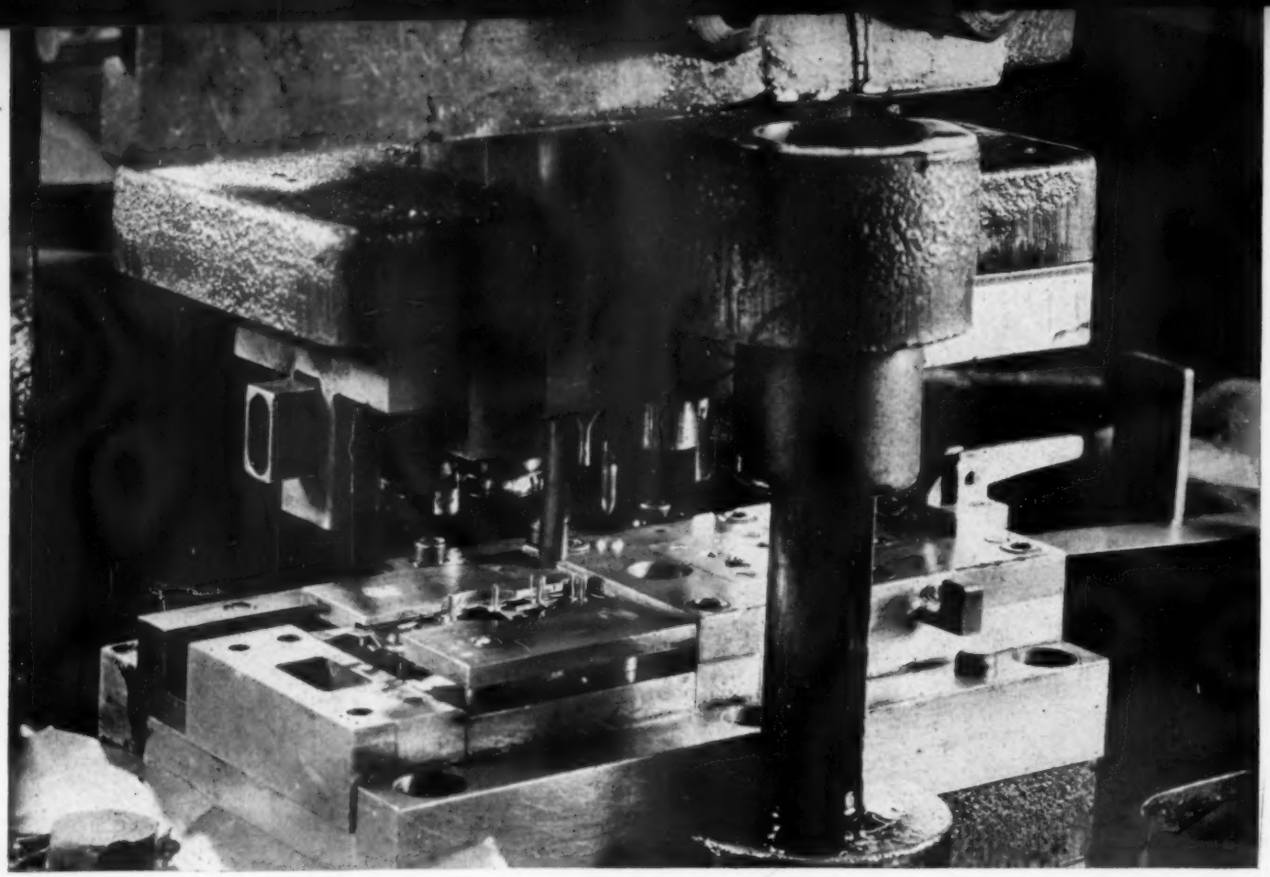
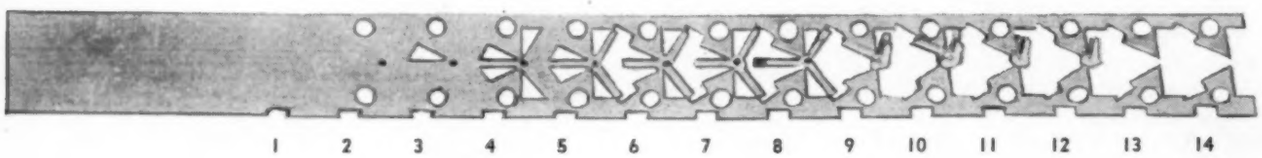


Fig. 20

PUNCH NIBS are fastened with screws if possible; for light work a braze may be employed



14-STATION PROGRESSIVE DIE incorporates a precision feed, as well as arrangements for air ejection of finished pieces. There are ten work stations, four empty stations being provided so there will be clearance for punches and dies in adjacent stations. At the last six stations, the strip stock is supported above the die plate in slotted, spring-supported plates which allow it to be moved downward onto tools mounted in the lower plate, thus permitting necessary folding and forming operations on the three jaws. Below, stations are indicated on a section of the strip fed into the die to check the functioning of various punch and die members. The four empty stations necessary for clearance are 6, 8, 10 and 12. The clutch itself is detailed on the facing page



14-STATION DIE MAKES TIP CLUTCHES

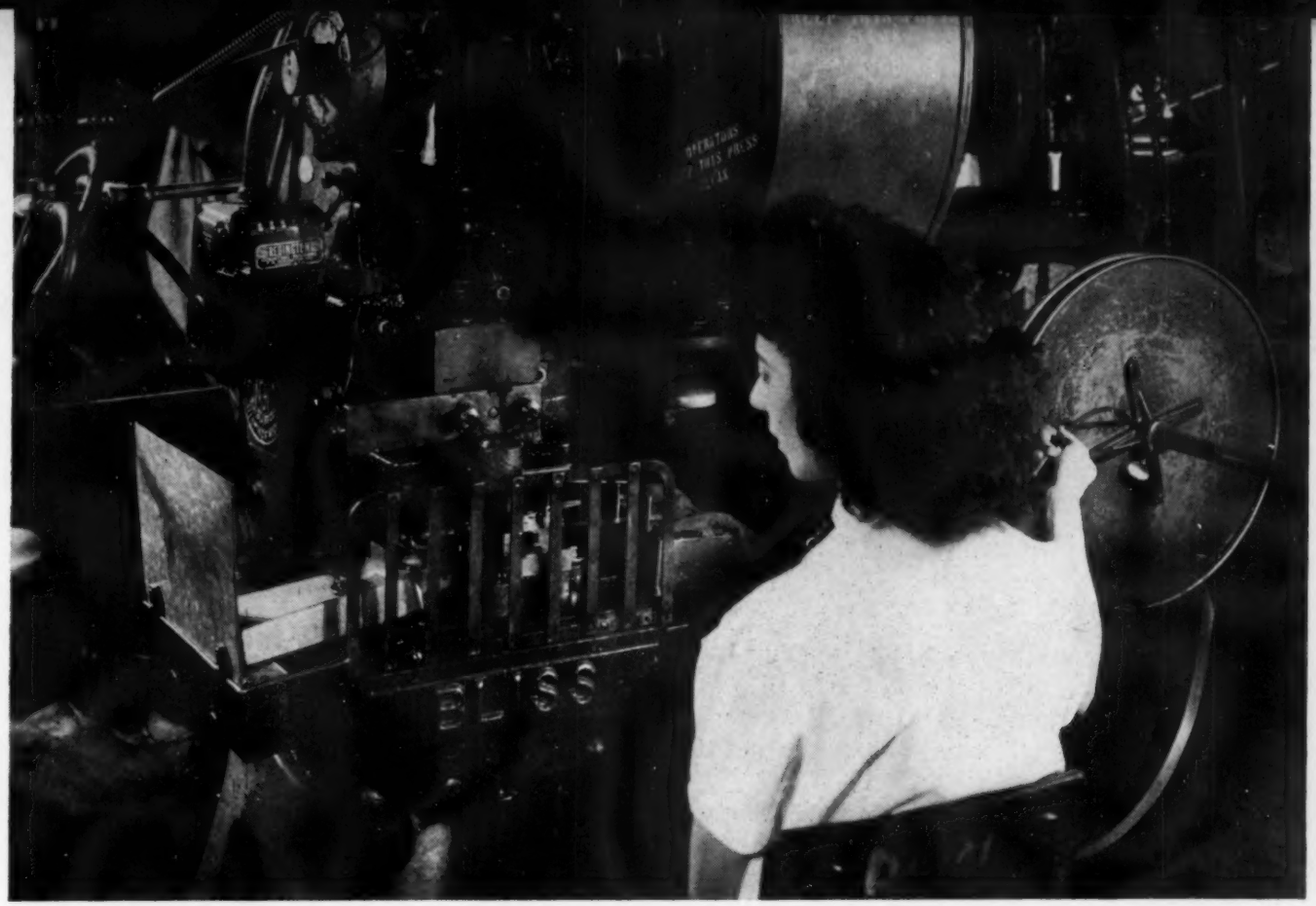
BY GORDON MURPHY

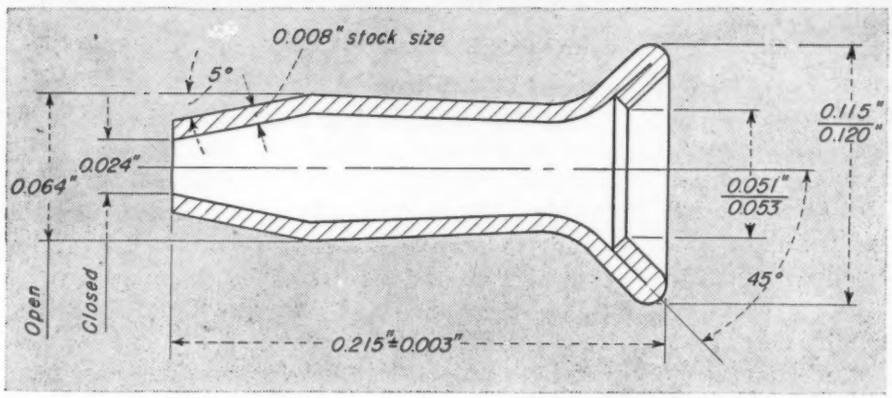
PLANT SUPERINTENDENT
EVERSHARP, INC.

IN THE CONICAL metal tip of each Eversharp mechanical pencil is a 3-jaw phosphor-bronze clutch. This clutch maintains pressure to keep the lead from shifting under writing pressure, and to keep lead from sliding through the tip bore while the automatic feed clutch is open. Clutches, 0.215 in. long and 0.115-0.120 in. in dia., are made in one operation from 0.0075 in. to 0.008 in. thick, ¾-in. wide strip.

The 14-station progressive die has a built-in precision feed for the strip stock. It is used in a No. 1 Bliss-Consolidated crank press operated at 120 strokes per minute, one clutch member being completed at each stroke. An air blast ejects finished clutches from the upper member of the die into a pan at the left. Scrap falls into a pan under the press through a sheet-metal tube from the lower bolster plate.

Strip stock is fed into the right-hand end of the die and moved progressively to each of the fourteen die stations, on 7/16-in. centers: (1) Notch side of strip for feed fingers, (2) Pierce 0.051-0.053 in. dia. lead-clearance hole in center of strip and ⅛-in. dia. hole for locating pin in each side of strip, (3) Pierce one triangular hole near center of strip, (4) Pierce opposite triangular hole near center of strip and two triangular holes on either side of lead-clearance hole, (5) Blank out scrap stock from in front of two legs of clutch, (6) Empty station to clear





LEAD CLUTCHES of phosphor-bronze for Eversharp mechanical pencils are completed in one operation on this No. 1 Bliss-Consolidated crank press. Production is 120 per min. The ¾-in. wide, 0.008-in. thick strip stock is delivered to the press in 8- to 10-lb. rolls, fed into this progressive die. Operator watches to see that the strip feeds freely and removes pans of parts and scrap when they are filled

FOR PENCILS

Feed and air-ejection equipment are incorporated in progressive setup to provide 3-jaw clutch from strip

coining punch and die set in next station, (7) Form three legs and center dimple with coining punch and die set, (8) Empty station to clear tools in preceding and following stations, (9) Bend three legs of clutch to vertical position by pushing center dimple down into cup with round cupped punch, (10) Empty station to clear tools in preceding and following stations, (11) Form three legs to final shape with collet-type die unit mounted on punch bolster, (12) Empty station to clear forming die used in preceding station, (13) Shear finished piece from strip with punch in lower die plate, (14) Cut off scrap from end of strip.

When the finished piece is sheared from the strip stock in the thirteenth station, it is moved up into a horizontal passage in the upper die assembly where a blast of air blows the piece into a small pan at the left-hand side of the press. These finished parts now are ready for cleaning and final assembly into the pencil tip.

Under normal operating conditions, about 350,000 pieces can be produced before punches and dies need resharpening. This amounts to almost 50 hr. of constant operation. The press is carefully guarded to prevent injury to the operator, whose principal duty is to keep the strip stock feeding freely, and to change pans for finished parts and scrap when filled.

A counter mounted on the press frame is connected by wire to the press slide so an accurate count of the production can be taken whenever desired.

ROUND TABLE

Friend—or Foreman?

"Gosh, Ed, I sure hope this fine weather holds for a while!"

"It'll probably rain all week-end, Al. It usually does. But how come you're so anxious about this particular week-end?"

"Bill Cline and I are going up to Lake Chatham for a little bass fishing. We hear they're really biting up there."

"Bill Cline! Say, doesn't he work for you?"

"Why, sure, Ed. Is there anything so odd about that?"

"Nothing odd about his working for you, but I didn't know you made a practice of going fishing your men."

"I didn't say that I made a practice of it, but I will say a lot of my best friends are men working under me, and I've been on some darn good fishing or hunting trips with some of them. What's wrong with that?"

"Al, when you do that, you not only leave yourself wide open for criticism, but you also practically tag your fishing friend as an 'apple polisher'!"

"I can't quite agree with you, Ed. The fellows that would call it 'apple polishing' are just the wise guys who would find some excuse for causing trouble anyway."

"Sure. But in this case, you help the wise guy out. The kind of fellow you like to go places with on the outside is usually a darn good worker. Isn't that right? So what happens when he comes up for promotion? He may deserve it, but if you give it to him, the wise guy can say, 'I told you so,' and make it stick. It puts you and your man right on the spot. I've seen it happen."

"Well, Ed, you have a good argument, but I've never had any trouble like that."

"Maybe you just haven't heard about it. Naturally no one would say anything to you."

"Well, what I don't hear doesn't hurt me. Besides, I look at it this way: I know it's poor policy to play favorites. So I don't. I don't let outside contacts with the men influence my actions on the inside. I play fair and I think the men realize it and think more of me for going fishing with one of the boys than if I acted very reserved and businesslike. I think you're too self-conscious."

"It's mighty hard to keep from doing a friend a favor, Al. Then, too, if your friend lays down on the job and you discipline him, it causes hard feelings too. I think it's a lot safer and easier to be fair if you don't make friends of your men, except, of course, group functions like parties or sports."

"It may be difficult for you, Ed, but I think I can be fair and at the same time go fishing with one of the boys. If afterward he lays down on the job and I discipline him properly, there won't be hard feelings. It's all in the way you handle it."

WHAT DO YOU THINK? *Can false or true charges of favoritism rise out of a harmless fishing trip? Is it possible to prevent enjoyable outside contacts from influencing you in matters of promotion, job assignment etc.? What has been your experience? Discussions of earlier topics appear on later pages.*

Practical Ideas

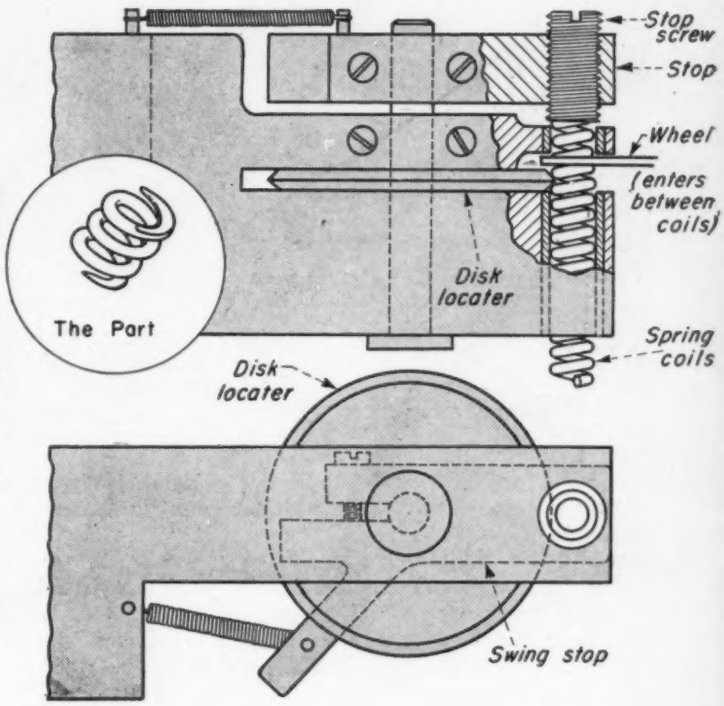
Rubber Wheel Cuts Short Springs

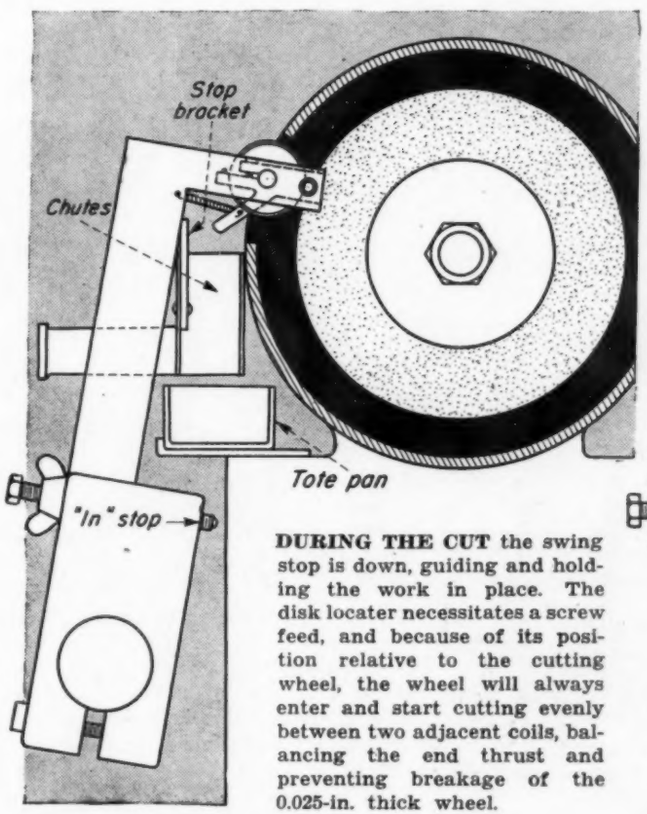
Hard-to-hold short coil springs now are cut off rapidly using an oscillating-arm attachment and a thin rubber-bonded abrasive wheel.

Previously wound in long lengths, spring stock is *screwed* into the finger bushing past a disk locater which makes sure that the wheel will always start its cut centrally between two coils. (Finger detail at right.)

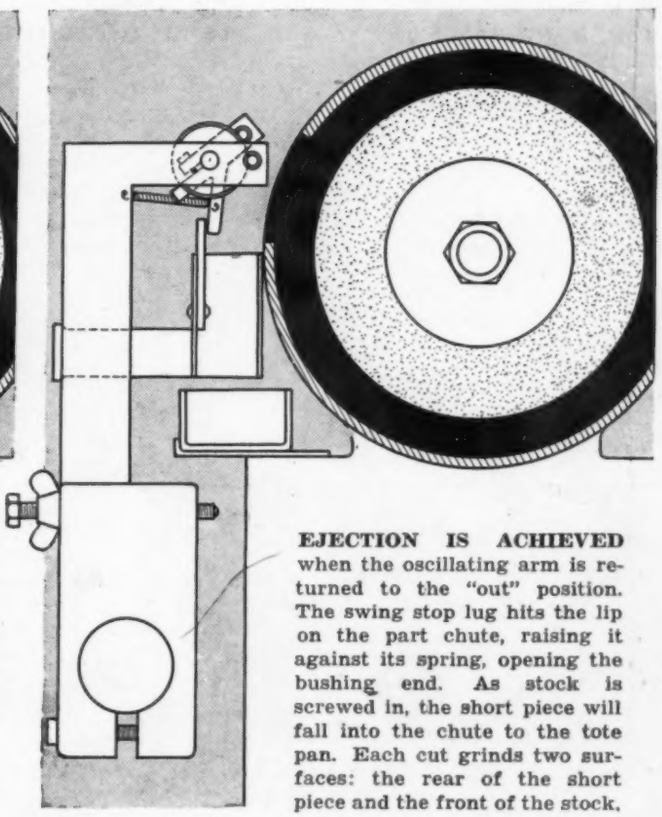
A spring stop, working knife-fashion, normally closes the end of the bushing, fixing the work length. (A set-screw adjusts stop length.) But when the arm retracts from the wheel, below, right, a hanging lug is restrained by a lug fixed to the machine, lifting the swing stop. At this point, the operator gives the spring stock a couple of turns, feeding it in and ejecting the completed spring out the end where it falls into a chute and tote pan.

Slight inward motion of the arm releases the swing stop lugs, allowing a spring to close the swings stop so the operator can set work for the next cut. *C. E. Lambert, W. Hartford, Conn.*





DURING THE CUT the swing stop is down, guiding and holding the work in place. The disk locater necessitates a screw feed, and because of its position relative to the cutting wheel, the wheel will always enter and start cutting evenly between two adjacent coils, balancing the end thrust and preventing breakage of the 0.025-in. thick wheel.



EJECTION IS ACHIEVED when the oscillating arm is returned to the "out" position. The swing stop lug hits the lip on the part chute, raising it against its spring, opening the bushing end. As stock is screwed in, the short piece will fall into the chute to the tote pan. Each cut grinds two surfaces: the rear of the short piece and the front of the stock.

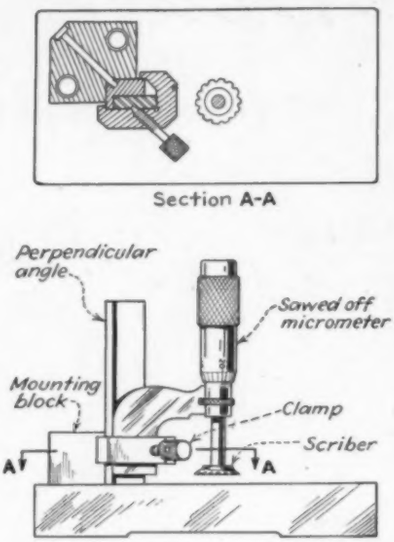
Micrometer Layout Tool Gives Greater Accuracy

HARRY FOX
New York, N. Y.

For those who require greater accuracy on small layouts than can be obtained from a hard to read vernier height gage, here is a quick-reading, dependable instrument that can readily be made from that old micrometer. This layout tool will measure up to 3 in. directly or, by working from a centerline and reversing the piece, the layout height can be as much as 6 inches.

The parts consist of a cast iron (or steel) base, to which is fastened, by two screws, a hardened steel block and upright which acts as a vertical support for the micrometer. This block and upright are ground and assembled in such a manner as to be perpendicular to the base and also high enough to enable the scribing of a line at least 3 in. from the base. The micrometer (an old abused one is ample provided it has a clamp) has had the anvil and part of the frame cut away, and the remaining frame ground square to the spindle in order to give a true reading. Flush on the end of the spindle, a hardened flanged disk is affixed by a setscrew which has several equally-spaced V-notches on its periphery. This is the actual scriber whose sharp edge leaves a fine line. Be sure to make this part of a thickness that will allow a full 1-in. movement of the spindle and of a diameter slightly larger than that of the micrometer thimble. Before assembling this on the spindle, recondition the spindle clamp (if necessary) so it will hold the spindle rigid when set.

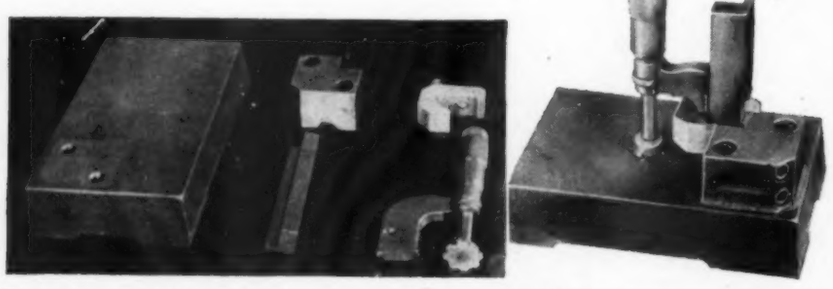
The remaining part is an aluminum clamp which holds the mike to the upright. Its screw is set at the angle that wedges the mike frame into the corner of the upright causing it to align squarely both ways.



Adjustable, double-action clamping gives this micrometer height gage almost unlimited continuous range

When in use, the positioning of this tool is fairly simple. Set the reading on the scale to zero and loosen the clamp, allowing the mike to slide down the upright until the flange is on the base, and then tighten. The tool is then set for a range of zero to one inch. For larger sizes, repeat as above but use either a 1- or 2-in. block between the flange and the base. The line is scribed by bringing the piece in contact with the edged flange and the resultant layouts are extremely accurate. The spindle clamp must be tightly locked before scribing to prevent turning.

I have also found this tool handy to use as a flange micrometer for measuring into difficult recesses; and by removing the block and assembly from the base, I have used this tool on the surface plate.



Components of layout tool are an old mike, a cast iron base, a positioning block, a piece of angle and a double-acting clamp

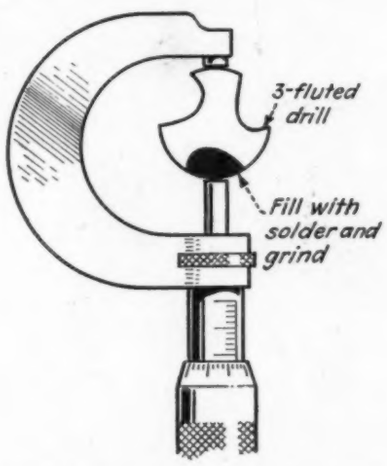
Space Multiple Threads Without Touching Leadscrew

FRANK T. LYNCH
Tonawanda, N. Y.

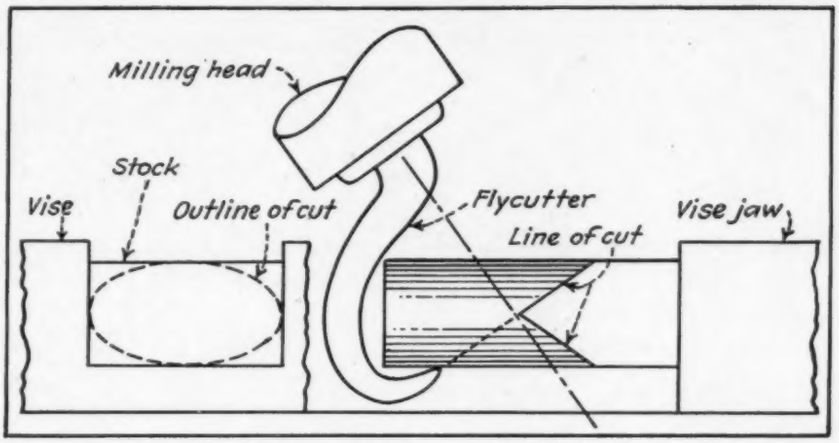
Here is a method for cutting multiple threads I have used for some time and I am wondering if it is in wide use elsewhere.

Set the compound rest at 30° (regardless of the thread contour) and then adjust the tool to cut the first thread. After this is finished in the usual way (using only the carriage cross feed), note the final cross-feed dial setting and bring the carriage back to the starting point and engage the half nuts on the leadscrew as if for cutting the same thread over again. Back off the cross feed and advance the compound *a distance equal to twice the inter-thread distance* (because of the 2-1-$\sqrt{3}$ relationship in a 30-60 triangle). If it's a double thread, this distance (on the compound micrometer) is exactly the same as the thread pitch; if a triple thread, it's 2/3 the pitch.

Uniform thread depth on the second (and successive) thread (s) is achieved by bringing the cross feed in to a distance $1/\sqrt{3}$ (0.866) times the compound advance short of the previous maximum depth of the cross feed.



Miking Drills — Circumstances may arise in the shop where it becomes necessary to grind down a three-lip core drill to a specified dimension. Because it is impossible to accurately mike a three-lip drill by miking from one lip across to another. I find it very simple and accurate to fill a portion of one flute with solder and then grind the drill to size. *M. J. Curcio, Racine, Wisconsin.*



Ice-tong shaped fly cutter produces elliptical section when the milling head is adjusted to the proper angle

Broach-Iron Solves Micro-Finish Problem

DANA J. MULHOLLAND
Newport, R. I.

An order for 300 manganese bronze bushings was sent to my shop; bushings were to be ⅝ in. O.D., 1½ in. long. The specifications called for a 16 Micro finish in the hole through the center.

Considerable time was spent experimenting with speeds, feeds, and various types of reamers trying to get the finish required. We did manage to get some good-looking holes, but the finish was not good enough and some trouble was experienced holding the 0.0002 in. tolerance. I finally decided to try a new idea I had in mind although I had never heard of it before. The new tool is a combination broach and iron. All pieces were completed with beautifully finished holes and no variation in tolerance. Before broaching, the bushings were drilled with a "B" drill, and reamed 0.2485 inches. The broach is pushed through with a ram in the turret.

Inclined Internal Fly Cutter Mills Elliptical Punches

W. W. BRUBAKER
Homewood, Ill.

We recently had to make a short punch of elliptical cross section. A rectangular piece of bar was selected which measured the same as the major and minor axes of the ellipse, and this was roughed to octagonal shape, or nearly to the final elliptical shape which was scribed on one end of the piece.

The milling head was set at the angle from vertical whose sine equals the ratio of the minor axis to the major axis, or the smaller to the larger bar dimension. A single or a double-point, ice-tong shaped cutter was made with a point-to-axis distance equal to the major elliptical radius. It is important to make the actual cutting edge as small as possible and to make it semicircular because the point of tool-to-work contact will oscillate back and forth on the tool as it rotates about the work and the ellipse produced will be a good approximation at best. The larger the point radius, the greater will be the deviation from a true ellipse. The profile of the tool should be laid out on a templet to make certain of sufficient throat clearance, according to the required ellipse length.

After cutting to maximum depth in one position, the work was turned over, enabling the tool to even up the ellipse to maximum depth on both sides of the piece.

Such a tool could be assembled from standard flycutter parts, and fitted with suitable bits, thus permitting a considerable latitude in adjustment, and the work could probably be subdivided into a roughing and a finishing cut, using a threading tool for better accuracy.

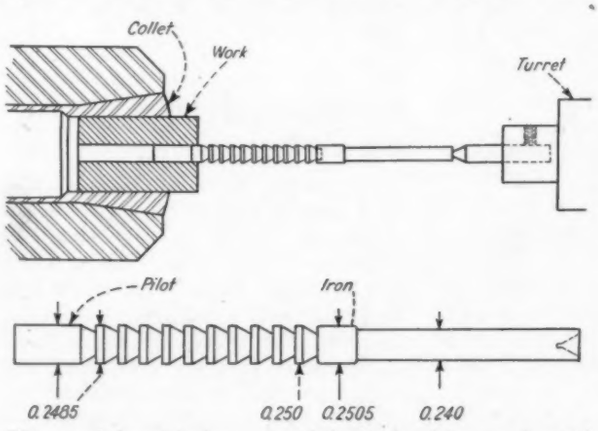
Floating Center Drill Locates Rod Centers

HARRY F. SCHICK, JR.
Brookville, Penna.

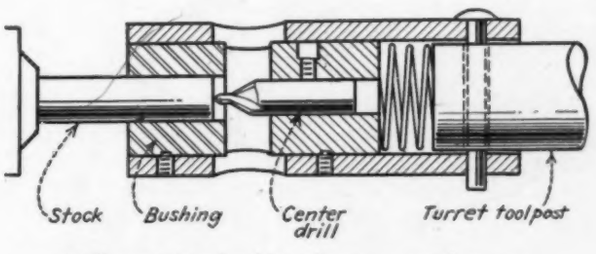
Close-tolerance work and a lot of backlash and play in the machine don't go together usually, but we were faced with the problem of making some aircraft turnbuckles in a hurry with nothing but this kind of machine to do the job.

The 0.005-in. eccentricity limit on the turnbuckle body center hole was easily exceeded by unavoidable looseness within the machine so something had to be done. Stock diameter varied only the slightest amount, permitting a hardened bushing to be slipped over the work.

Turret lathes were used and this operation (drilling the center hole) was performed with a loose-fitting tool consisting of the bushing, a plug toolholder, and a center drill. Once



This push-breach has a polished shoulder to burnish the work



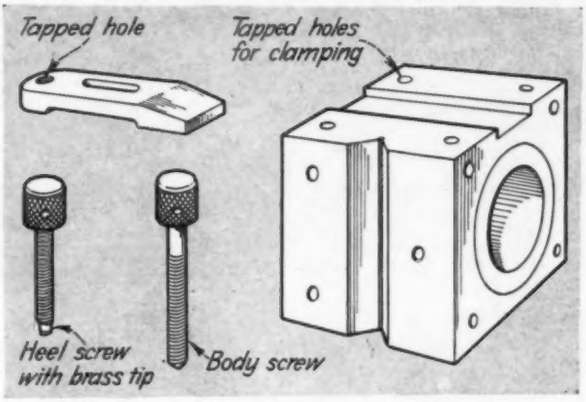
Self-centering bushing floats on work to assure close accuracy on inaccurate machines

the bushing was started over the work diameter, the turret's only responsibility was feeding and keeping the tool from turning. A heavy spring between the toolholder and the turret toolpost helped to cushion and absorb vibrations and to prevent chatter.

The actual through-drilling could be performed in the same manner, but we found that once the hole was correctly started, the drill would guide itself and the bushing was no longer required.

A long hardened bushing sleeve was made a slip fit for the maximum work diameter. Permanently secured in the center of this sleeve was a plug carrying the center drill. The tail end of the bushing was a loose fit on the turret toolpost, held in place with a loose pin.

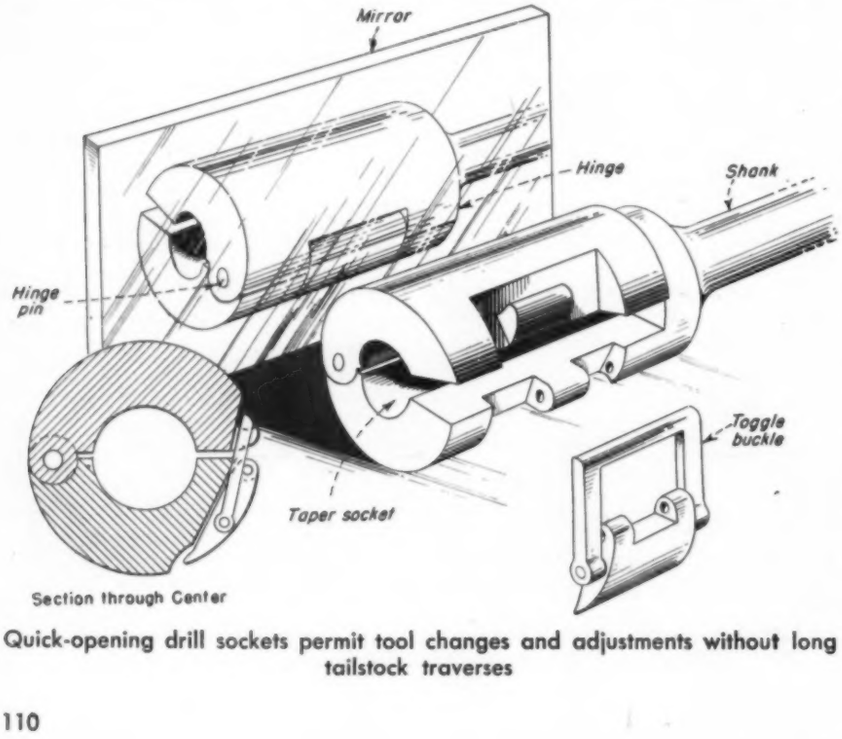
This arrangement permits the center drill to find the center of the piece regardless of play or misalignment in the machine elements.



Hinged Drill Socket Saves Tailstock Feeding

H. MOORE, Leeds, England

One of the major delays in lathe work is the continuous running in and out of the tailstock spindle when drilling and reaming holes. If the work is short, the spindle has to be run well out to reach it and keep clear of the saddle and, consequently, it has to be run back the same distance each time a tool needs to be knocked out. Even when the tail-stock spindle can be used fairly well back, it is often not safe, or even possible, to pull the drill or reamer forward to remove it from the spindle without fouling either the work or the chuck. These things matter little when only a hole or two needs attention but some jobs are predominantly drilling and reaming and too much time and energy are spent in getting the tools out.



Quick-opening drill sockets permit tool changes and adjustments without long tailstock traverses

Cube Aids Grinding Setups

That many of our commonly accepted tools and accessories are not well adapted for a wide range of work is only too obvious. Here is a simple cube, which, to my mind, goes further toward the goal of universal adaptability than anything of a similar nature which I have seen before.

The block itself serves as one of the jaws of a toolmaker's clamp, permitting work to be held securely (one or more pieces) in a particular position relative to the cutting tool with one or more conventional jaws borrowed from standard clamps. Its accurately ground perpendicular faces permit mounting in many positions, and often several operations can be completed without changing the initial clamping. Usually, the cube can be used for precise sine-bar setups, and then retained as the angle plate needed in the following shaper, or grinder operation, eliminating the time-consuming changeover.

Assorted V-grooves simplify the clamping of bars and pins, and a deep, squared blind hole in one face permits the cube to be chucked on an expanding mandrel for special work. In some cases, the hole can be fitted with a bushing to suit special parts. *W. B. Hurt, Bengal, India.*

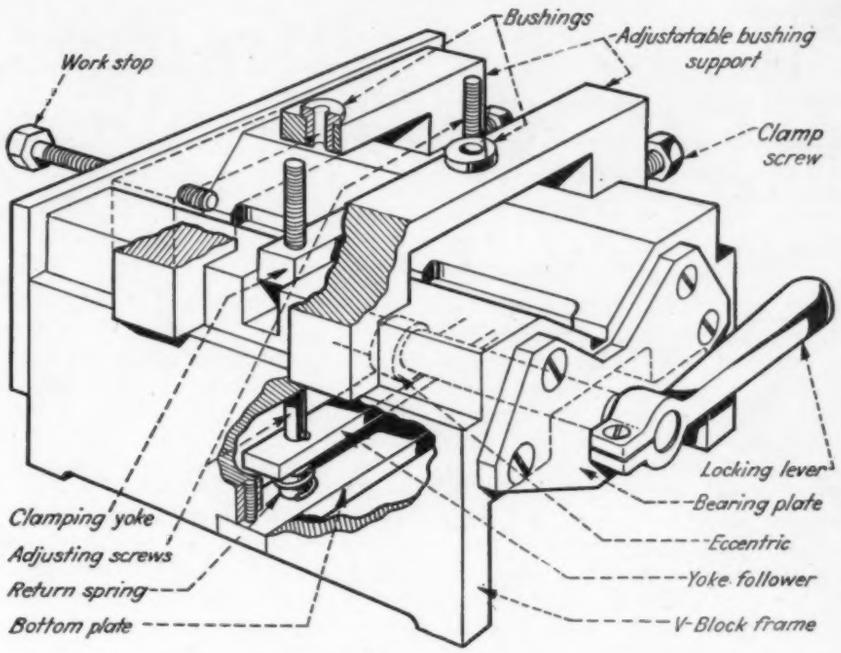
Toolbit Mockups Insure Uniform Regrinds

Faulty cutter grinding is responsible to a large extent for poor production rates and undue wear or strain on machines. It is true that machine operators are expected to know how to grind their tools. Often, however, special setups require experiments with angles of rake, clearance, lips, offset, etc. Three-view drawings and other complicated projections or notation systems can prove ambiguous and puzzling, and are at best

difficult to understand when a person is unfamiliar with them.

Here is one solution to the problem. In spare time I went around the shop from one machine to the next and accumulated and catalogued the actual bits which had proven the best for each job. Each of these was exactly duplicated in hardwood and all of them were fastened to plywood panels with thumbscrews and the panels were hung over grinding machines for easy access.

Now a machinist can examine a model of the bit he desires to reproduce or, if necessary, he can remove it from the board or panel and compare it with the actual bit as the grinding progresses. The catalogued, numbered bit shapes may be indicated on blueprints or work sketches, thus aiding the rapid and efficient work output with a minimum of delay. *George Burnley, Oakland, California.*



V-block equipped with cam-action work clamps and sliding bushing bridges handles all kinds of pin drilling

Screw Cutting Lathe Graduates Scales

Scales of almost any units can be engine-divided to high degree of accuracy with a lathe equipped with a full set of change gears. We have made metric scales complete with verniers, accurate to within 0.000001 inch, as well as shrink scales and special scales of various kinds for instrument work.

For the 1-mm. scale and vernier, gear the leadscrew to cut a 1-mm. pitch thread and mark the chuck so it can be lined up with a fixed index every time it comes around. Use a fine, sharp tool (one of the comparatively new tungsten carbide scribers would be excellent) and make a scratch on the work a certain length every revolution of the chuck, and longer scratches every fifth and tenth turns.

For the vernier, nine marks are required for a 10-mm. distance, making the distance between marks 0.043744 inches. A thread pitch of 0.04375 in. is obtainable with gears 35 and 20 driving and 80 and 100 driven (with a 2 T.P.I. leadscrew) which is accurate within 0.000001 inch.

A patternmaker's ¼-in. shrink scale likewise can be cut using 35 and 70 as drivers and 40 and 120 as followers, giving a pitch of 0.25521 in.; 48 revolutions move the saddle 12.25008 inches. *U. Wheatley, N.S.W., Australia.*

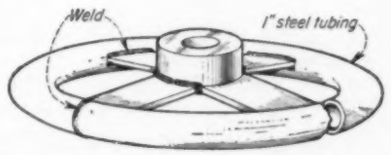
Universal V-Block Jig Establishes Hole Centers

It often happens that two or more transverse holes have to be drilled into pins for insertion of cotter pins. The number of pins to be drilled often does not justify the manufacture of a special jig for this purpose and therefore each pin has to be marked out individually. This process not only costs much time but is also not very accurate.

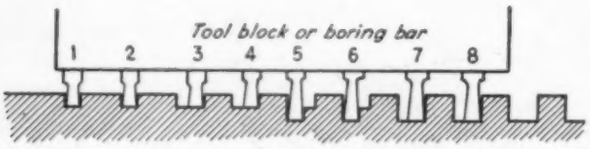
Here is a universal drilling jig which permits the clamping of pins of various diameters and allows for adjustment of the drill bushings according to the center-distance required.

The jig is a V-block containing a clamping device consisting of a lever, an eccentric and a built-in axial shaft, clamp frame. The height of the clamp above the V-block can be adjusted according to the diameter of the pin by turning two screws. Return springs facilitate removing the workpiece by pushing the clamp up. A locating screw fixes the position of the pin. The drill bushes are accommodated in sliding bridges. After the distance has been set the bridges can be clamped by tightening the bolts. The drill bushes are exchangeable and bushes should be kept available according to the sizes of split pins on stock. After setting the jig to suit the diameter of the pin and after adjusting the center distance required, the jig can be used in the same manner as a jig designed particularly for this job.

Apart from such jobs as described above, the jig can also be used for many other kinds of drilling work, where the location of one or more holes in relation to each other or to the workpiece is of importance and where the hole has to pass through the center of the pin. *Gerhard Wenke, Los Angeles, California.*



Lightweight Handwheel—Having 1/3 the weight and about 1/3 the cost of a cast wheel, this wheel is easy and quick to make and has excellent appearance. The rim is made of black or bright tubing, bent into a ring of suitable diameter, and welded together. The hub is mild steel, bored and keyed. Spokes are plain bar stock, welded to the hub and to the rim. The ring weld should be ground smooth to prevent scratching hands. *W. Heinemann, St. Georges, The Black Forest, Germany.*



Inside or outside double-pitch square thread
Section view

Bits 1 and 2 start the two threads; 3 and 4 finish to width; 5 and 6 sink the lead wall to depth; 7 and 8 finish to full width

FAST MULTIPLE THREADING—This threading tool arrangement was devised to speed up production of a large order for forged steel nuts; it reduced previous production times by 30% compared with the normal practice of employing a single threading tool. Each tool is broader at the cutting face than half the thread space and the leading tool acts as a chip breaker to the rear tool, thus giving free and rapid cutting action with a minimum of frictional tool wear. Tools overlap the center of the thread space and when properly ground and set, a smooth bottom is obtained. When a single square thread cutting tool is used, loss of size results, due to frictional wear and subsequent grinding and a correct size tool must be employed to complete the job.

Usually with coarse pitches, an undersize tool is first used to rough out the thread space, after which a correct size tool is mounted to finish the thread and if the material is difficult to cut and wear is excessive, the finishing tool needs frequent dressing and regrinding.

The two-tool method is seen to greatest advantage on the forming of coarse-pitch threads but is also a time saver on fine threads. Loss of tool size is relatively unimportant when using two threading tools in the same bar, and grinding to correct tool wear can be practised till each tool is reduced in width to half the thread space, when the overlap of the cutting faces disappears.

When tool wear takes place, grinding is carried out and, first, paper, then metal shims are inserted between the tool shanks to give the correct mike reading. In this way long, tool life is assured, keeping size presents no problem and, due to the absence of chips clogging the tools, permits of high cutting speeds being employed.

The tools are ground in place. The toolbar, provided with permanent centers, is mounted on a tool and cutter grinder with the squared end of the bar set over to give the necessary front angle to the cutting tools and a few passes across a cup wheel is all that is necessary to give the desired cutting edge. The squared part of the bar is then set at 90° to the grinding machine table for grinding the top rake, using a formed wheel to give the desired angle, after which the outer cutting faces of the tools are miked to determine the thickness of shim required to give the desired size. After shimming to size, the bar is again mounted on the tool and cutter grinder and the tools are set for line by bringing the square post of the grinder to bear on the cutting face of each tool simultaneously. The tools are then locked in position.

Bits 1 and 2 start the two threads; 3 and 4 finish them to width; 5 and 6 finish the front wall of each to final depth and 7 and 8 complete the job. *C. D. MacKinnon, Airdrie, Scotland.*

NOW...$25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

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How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Thirty-third Selection—A. F. Scoblic's Bearing Puller

HOW EMPLOYEES BENEFIT FROM THE NEW LABOR LAW

This article is a statement of the rights of employees under the new labor law and what benefits they derive from it. It was prepared specially for AMERICAN MACHINIST by an eminent legal authority on labor matters

THE PRIMARY PURPOSE of the new labor law is to promote peaceful settlement of labor disputes through collective bargaining.

It does exactly that by requiring "the employer and the representative of the employees to meet at reasonable times and confer in good faith with respect to wages, hours and other terms and conditions of employment."

To that end, the new law establishes "a Federal Mediation and Conciliation Service" to aid the parties in reaching an agreement.

These facts may come as a shock to those who have been told that the new law is a "slave labor law" and a law to bring about a depression and unemployment. The truth is that the law gives the industrial workers of this country greater protection in many respects than before against injustice and wrongdoing. Let's see why this is so:

Existing Contracts Continued

Notwithstanding any provisions of the new law, every existing contract and every contract entered into within 60 days after passage of the law will be treated as valid, provided that the new contracts made within that time limit do not run for more than one year.

The single exception to this rule is that agreements granting checkoff without the consent of the employee cannot continue beyond July 1, 1948.

Congress actually dealt gently with the rights involved in existing agreements, despite the fact that it had the power to wipe out all existing agreements (a power which it freely exercised against the employer under the Fair Labor Standards Act).

Rights of unions and employees in current agreements are thus well preserved.

Right to Organize

Under the Wagner Act, employees were protected in the right to organize and in the right to bargain collectively through a union of their own choosing.

These rights are retained in the new law. In a number of particulars they are protected more than they were before.

An employee's right to organize is protected from all interference. This carries with it his right to join a union of his own choosing and his right to refuse to join.

Formerly a union could go through all the trouble of an election and win the election and be certified by the Labor Relations Board. Whereupon the losing union still would be free to attack and obstruct members of the winning union, because the employer, as required by law, recognized the winning union. The new law gives the National Labor Relations Board the authority to stop this interference.

To illustrate: manufacturing employees formerly might have chosen a CIO local to be their bargaining agency. When their products were to

be installed in some building in another city, the AFL employees often struck the building rather than permit the CIO products to be used.

This practice completely destroyed the market for the products of the CIO employees—all because the employees had made use of their right to organize by choosing a CIO union.

The same would be true if factory employees elected an AFL union and CIO employees in control somewhere else in the country attempted to boycott the AFL-made products.

The new law permits the National Labor Relations Board to issue an order and even to seek a court injunction forbidding such activities. It thus protects the right of manufacturing employees to organize and to choose their own bargaining agent.

Jurisdictional Strikes

Other kinds of jurisdictional strikes, in which one union fights another, also are made unlawful and subject to prohibition by the National Labor Relations Board—all for the purpose of protecting the right of employees to choose the particular union which they desire to represent them.

The National Labor Relations Board is in a position to settle such questions peacefully and justly without forcing rival unions to engage in a "dog-eat-dog" policy at the expense of their members.

Union Security

The closed shop, union shop, maintenance of membership and like forms of union security are dealt with on a compromise basis. The compromise takes into account the union complaint against "free riders," yet protects the individual worker against arbitrary conduct on the part of some unions.

It is one of those compromises which will not satisfy extreme advocates of the open shop or of the closed shop.

Under no circumstances may a man be discharged for non-membership in a union if he tenders his union dues. On the other hand, he may be required under some circumstances to tender union dues for the term of the contract.

Agreements providing, in effect, for maintenance of union dues may be entered into if a majority of employees in the bargaining unit vote in favor of such an agreement by secret ballot held under the auspices of the National Labor Relations Board.

No other form of closed shop, union shop or maintenance of membership is permissible under the new law.

The net result is that no employee can be compelled to support a union against his wishes except by a majority vote taken by secret ballot. At the same time the union is protected against "free riders" if such a vote is taken, but cannot deprive a man of his job merely because it elects to keep him out of its membership.

The individual employee hence has two new protections: (1) assurance of the right to express his opinion by secret ballot held under supervision of the National Labor Relations Board; and (2) job security, because the union no longer can deprive him of his job so long as he pays the usual union dues.

Protection of Union Members

Before any labor organization can institute any proceeding before the National Labor Relations Board to secure an election or to protect its right to organize, it must file these reports and papers with the government:

1. A copy of its constitution and by-laws (with the Secretary of Labor), giving the name, title and compensation of its three principal officers. It also must reveal the names, titles and compensations of all other officers receiving more than $5,000 per year. It also must state the manner in which such officers were elected.
2. A statement showing the amount of initiation fees and dues required of members.
3. A statement of its assets, income and disbursements for the last fiscal year, together with proof that a copy of such financial report has been furnished all of its members.
4. Affidavits (with the National Labor Relations Board) by each officer of any labor union seeking relief from the Board and by each officer of the national or international union with which it is affiliated. Each affidavit must state that the officer is not a member of the Communist party and is not a member of and does not support any organization which believes in or teaches the overthrow of the United States government by force or by other illegal means.

Individual employees or minority groups now possess the right to have grievances adjusted in their own behalf and in harmony with the collective bargaining agreement in force, provided the union representatives are given the chance to be present at such adjustment.

Checkoff of union dues will be legal hereafter only by the individual employee voluntarily signing his consent.

Any employee who works under an agreement requiring union membership as a condition of employment is entitled to seek relief from excessive or discriminatory initiation fees by asking the National Labor Relations Board.

If any employee or group of employees is dissatisfied with his or their bargaining agency, application may be made to the National Labor Relations Board for a secret ballot election. But such election is not to be held until 12 months after any previous valid election.

Strikes

The right of an individual employee to quit work is unqualifiedly and expressly protected. The law forbids any involuntary or compulsory service. Note the following provision in the law:

> "Nothing in this Act except as specifically provided for herein, shall be construed so as to interfere with or impede or diminish in any way the right to strike or to affect the limitations or qualifications on that right."

None of the provisions of the new law interferes in any real sense with the final right of employees or of their union to engage in strikes or in picketing for improved conditions.

After all, the right to maintain an organized strike against the employer or against the public cannot morally be justified if carried out in violation of a contract. Nor can it be justified if conducted for an unlawful or unwarranted purpose, such as an attack upon the employer because he is performing his legal duty to deal with a rival union which has won an election.

Unfair Labor Practices

Under the Wagner Act, only an employer could be guilty of an unfair labor practice. Under the new law, a new code has been established forbidding certain unfair conduct on either side.

It is still an unfair labor practice for employers to dominate or interfere with the right of employees to organize or choose their bargaining agency. This protection is substantially the same.

Now it is unlawful, however, for either an employer or a union to interfere with the right of an employee to organize or remain unorganized. The sole exception is, as already stated, that a union shop agreement requiring continued payment of dues may be entered into by vote of a majority of the employees.

It is now unlawful for a union, as well as for an employer, to refuse to bargain in good faith. Prior to the new law, unions in some instances refused to bargain in good faith.

It used to be lawful for unions to combine by jurisdictional strikes and boycotts to interfere with the right of a group of employees to choose their own bargaining agency. Such action today is unlawful.

Now both the union and employer have the right to apply to the National Labor Relations Board for an election. Formerly only the union had this right.

Freedom of Speech

Employers and employees alike are free to express their views to each other orally or in writing under the new law "if such expression contains no threat of reprisal or force or promise of benefit."

The general impression hertofore was that the employer had no right to state his views on union matters to his employees and that all such information had to come from union representatives.

Many employees in any large group naturally wish to hear both sides of a question before making up their minds. That is the democratic way of doing things, especially in a country which prides itself on its respect for the right of free speech.

Supervisors

No employer is required under the new law to deal wtih a union comprised of supervisors. Supervisors, which include foremen with real authority, in fact, are excluded specifically from the bargaining unit.

This provision in the new law confirms the policy of most unions in the past. Unions generally have felt that supervisors were too closely allied with management to be taken into secret conferences of union members.

Suits for Damages

Unions are granted the right to sue employers for violation of contracts. Unions, in turn, are subject to suits for damages for the following:

1. Violations of agreements with employers.
2. Secondary boycotts of a certain kind.
3. Jurisdictional strikes.

Court judgments for damages against a labor union, however, can be enforced only against the funds of the union and not against any of the individual members. Nevertheless, the procedure above outlined makes unions, now grown into

powerful institutions, responsible for their actions, just as employers are.

Restrictions on Injunctions

Those who framed the new law, in considering the right of employers or employees to go into court for protection, could choose between the right to secure an injunction or the right to collect damages, or both. They have given the unions their preference in the new law, since unions have shown far greater opposition to the injunction, compared with jury trial for damages.

It seemed far better in some ways to enjoin persons from committing an unlawful act than to wait until the wrongful act was done and then collect damages. Nevertheless, Congress did not give to the employer under this law the right to go to court for an injunction, such as is provided for under such statutes as the antitrust laws where employers are involved. Such denial is out of deference to the feelings of unions.

Bear in mind that no employer is permitted to go to court and secure an injunction under the new law. Thus the Norris-LaGuardia Act, designed to protect unions from injunctions secured by employers, is still in force.

Except in national emergencies, only the National Labor Relations Board can issue cease and desist orders or obtain injunctions against unfair labor practices.

National Health and Safety

If a strike or lockout affecting an entire industry or a substantial part thereof is threatened, to the point that it will "imperil the national health and safety," the Attorney General of the United States, by direction of the President, may apply to the courts for an injunction against such strike or lockout for a limited time. This action may result in suspending a strike or lockout for a maximum of 80 days.

But even the President may not direct the Attorney General to ask for an injunction until the facts have been investigated by a board of inquiry which he appoints.

During the time that an injunction is in effect, the National Labor Relations Board must take a secret vote among employees as to whether they wish to accept or reject the employer's last offer. By this means, the rights of union members are further protected.

Presumably the great body of union and non-union employees will not object to a law which merely requires a union to stop, look and listen before plunging the nation into a disastrous coal or steel strike which imperils national health and safety.

These provisions and safeguards, with the various inquiries and attempts at settlement prescribed, afford better protection to unions against injunctions secured by the government than did the former law. Under that law the federal government, by direction of President Truman, obtained an injunction against the coal strike called by John L. Lewis.

Political Contributions

Unions formerly were able to compel practically every person in certain industries (notably the coal industry) to join the union as a condition of employment. The persons thus employed had many political complexions—there were Democrats, Republicans and Socialists.

It then was possible for the union, as in the case of the United Mine Workers, to contribute $600,000 in support of a Democratic candidate against whom they wished to vote. It was an un-American procedure.

Congress reached the conclusion that no man should be required, under a democratic government, to pay tribute to a political party to which he was opposed. Hence union membership, which relates solely to economic conditions, should not be tied to political support.

Labor organizations as well as corporations, under the circumstances, are prohibited from diverting to political purposes money contributed for economic purposes. In other words, neither corporations nor unions may donate funds to a political campaign.

The new law, on the other hand, in no way prevents union members from organizing themselves into a political unit to contribute money to a political party. But the contribution cannot be from the union's own funds.

This part of the new law is an amendment to the Federal Corrupt Practices Act, which has been on the statute books for some time in relation to contributions by corporations. It applies the same rule to labor unions that it applies to corporations.

Reprints can be ordered at $2.50 per 100 or $20 per 1000 from Editor, AMERICAN MACHINIST, 330 West 42nd Street, New York 18, N. Y.

NEWS OF METALWORKING

Heavy and Light Machine Tools Held Plentiful in Los Angeles Area

LOS ANGELES—With the exception of some equipment used in sheet-metal fabrication, machine tools, both heavy and light, are plentiful here. Despite an increase of 116% in industrial activity during the last five years, availability of machine tools has not restrained industrial development.

Only power brakes, Do-alls, circular saws, shears and drill presses are short, with delivery schedules of 18 months or more.

Lathes Readily Obtainable

Lathes of all types and sizes, except perhaps the small tool type, are easily obtainable from manufacturers, second-hand dealers, or war surplus stocks. Smaller equipment is absorbed rapidly by priority GI's, who are establishing garages and job shops all over Southern California.

Since the Los Angeles area was engaged in manufacturing military aircraft to a greater degree than any other section of the nation, an abnormal quantity of the larger and costlier specialized machinery was installed during the war.

Surplus Tools Hamper Sales

When this equipment was declared surplus and thrown on the market by WAA, both the regular balance of supply and demand, and the normal price structure was upset. Machine tool manufacturers, who had chalked up increases of but 15 to 20% in price during the entire last six years, find that mounting production costs make it virtually impossible to compete with WAA prices.

While the Clayton formula for price-fixing applied to prices of equipment transferred by WAA to users, and while considerable effort was being made to discriminate between actual buyer-users and resale agencies, surpluses were absorbed in an orderly manner.

Price changes, inadequate inventories of available items, and priority buying of the better machine tools have hampered surplus disposal.

$6 Million in Sales

Between October, 1946, and June, 1947, the Los Angeles WAA office disposed of $6 million worth of machine tools (acquisition cost). There is still a large stock of specialized equipment to be sold. As WAA faces personnel cuts, an effort is being made to increase sales through WAA's new cataloging program, and accelerated merchandising sales programs.

In the heavy tools and special equipment class, machinery of the shrinking aircraft plants and aircraft parts manufacturers is a drug on the market.

Drop hammers, for instance, which were indispensable during the war, are being dismantled and sold for scrap, partly because their weight precludes shipment to distant points.

Offerings Find No Takers

Hydropresses are being sold to shops that are turning from small-quantity products to extensive production schedules on staple goods. Spot welders, bought by some aircraft plants in lots of dozens and even hundreds, at prices around $10,000 to $12,000 each, are now being offered at 10% of their list price—and no takers.

In the same class with drop hammers and spot welders are routers, dimplers and rivet squeezers, and seam welders. These will continue to be plentiful for some time to come, while all types of arbors, other lathe attachments, and standard sheet metal shop tools of all sizes are virtually unobtainable.

Machine Tool Show Attendance Expected to Surpass 100,000

CLEVELAND—With exhibitors completing plans to move $16 million worth of machine tool displays into the Dodge-Chicago plant, the 1947 Machine Tool Show — Sept. 17 through Sept. 26—is being awaited eagerly by thousands of metalworking officials and representatives throughout this country and abroad.

Swan E. Bergstrom, chairman, Show Committee, National Machine Tool Builders' Association, and sales manager, The Cincinnati Milling Machine Co., reports advance registration indicates attendance may exceed the original estimate of 100,000.

Foreign Registrations High

Foreign visitors have been making plans to attend for months. Registrations have been received from 22 foreign countries, including an official party of 30 from the British Machine Tool Trades Association. In addition, there will be representatives from resident offices of Czechoslovakia, France, India, The Netherlands, Poland and USSR.

Chief interest is expected to center around machine tools entirely new in design. Others will be long-tested machines with new attachments and applications. One exhibitor will have 29 machines, all new in size, capacity, or application.

As of July 15, the 500,000 sq. ft. of floor space was assigned to a total of 269 exhibitors.

Surplus For Norway is shown being loaded aboard the Swedish freighter "Erland" in Cleveland recently. This is the first shipment of surplus machine tools from that area, which has 77% of its inventory tied up in that kind of equipment. WAA's K. E. Karlson, who has had a lengthy association with Swedish and Norwegian manufacturers and toolmakers, and his assistant, James Munro, have corralled thousands of dollars' worth of foreign orders and claim this is a mere trickle compared with orders that will be forthcoming

Gaging Business

Machine Tool Market Firmer

The machine tool market appears to be getting firmer. Despite vacation periods and normal summer lull, orders for new machines are on the increase. Many firms, who planned new installations but held back from actually buying, are reported placing orders.

New orders for June of $22,640,000 —reported by 178 members to the National Machine Tool Builders Association—represent a $2,810,000 increase over May orders of $19,830,000. Shipments during June amounted to $21,500,000, as compared to $22,505,000 for the preceding month. June cancellations were $2,425,000, nearly half those of $4,500,000 for May. New foreign orders for June—as listed by 137 members—amounted to $4,475,000.

Total new orders for the first six months of this year amounted to $143,354,861, as compared to $155,780,089 for the first six months of 1946.

Coal Settlement Aftermath

Some effects of the soft coal settlement remain to be seen. Steel users breathed a sigh of relief when miners returned to the pits, assuring continued steel mill operations.

Hand-to-mouth steel operations were pointed up with the announcement by General Motors of a one-week shut-down in passenger car production in an effort to build up sheet steel inventories. The coal miners' pre-settlement vacation was accountable in large measure.

Fabricators are awaiting the coal settlement's effect on steel prices. Important production considerations will overshadow opposition to any price increases. It is pretty much accepted now that sheet and strip demand will be unsatisfied until well into the first quarter of 1948.

Plant Expansion Plans Revamped

Increasing availability of materials in mid-1947 is leading American big business to revamp plans for construction of new plant and purchase of new equipment in the latter part of the year.

According to a Department of Commmerce survey of capital outlay for new plant and equipment, about $3.8 billion will be spent during the third quarter of this year. This is $600 million more than actual expenditures in the first quarter, about $200 million over second quarter estimates, and about $400 million over earlier estimates on what would be spent in the third quarter.

Although economists had not expected the capital outlay peak reached in the last quarter of 1946 to continue, the latest figures show that not only is the peak continuing but it may be exceeded late this year. On an annual basis, 1946 showed a rate of $12 billions in expenditures, while this year, if quarterly spending continues as it has, the outlay may run as high as $14 billion.

Ordnance Demands Awaited

Speculation is rife over what steps might be taken by the Government for increased ordnance production. Many manufacturers, who are turning out peacetime products in quantity, are aware they might be called upon to fulfill ordnance contracts. In such an event, they wouldn't want to be caught totally unprepared, to the detriment of their peacetime production.

Ordnance equipment manufacturers are convinced they might be called upon for expanded operations soon. As soon as Congress straightens out its thinking on military requirements, it is felt ordnance production demands might jump.

Many smaller shops, finding it difficult to keep going because of postwar supply shortages, are hoping increased ordnance requirements might draw them into the orbit and lift them over the rough spot.

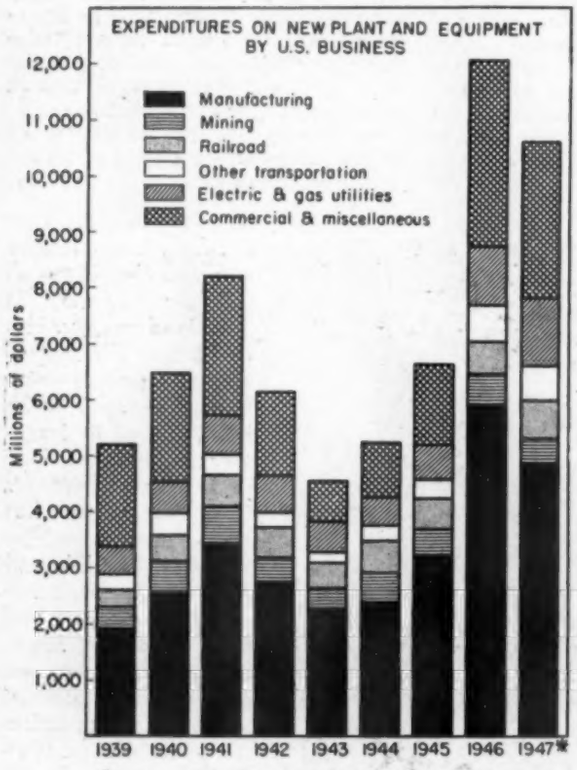
Appliance Makers Rushed

Household appliance manufacturers are working at top speed to meet unprecedented demands for their range of products. For example, automatic washing machines have caught the public's fancy to a point some manufacturers predict substantial sales for the next five years. One manufacturer said that entrance of new producers will help rather than hinder business.

The biggest handicap involves sufficient inventories of raw materials. Supply lines are in somewhat better shape, but appliance manufacturers hope supply bottlenecks will be erased soon.

Farm Items Going Strong

Farm equipment builders predict small farm owners will buy $1 billion worth of machinery a year for several years. The trend toward increased mechanization on small farms is accountable. Tractors are in top demand. One large manufacturer plans to increase tractor production this year 76% over 1946, with substantial production increases in other farm equipment lines.



*Based on actual figures and estimates of anticipated capital expenditures of business.
Source: Securities and Exchange Commission

Expenditures For New Plants and equipment have been increasing steadily since the beginning of 1945. It is estimated by the SEC and Department of Commerce that about $3.8 billion will be spent for such purposes during the third quarter of this year. This is $100 million more than the estimate for the second quarter, and $600 million greater than that actually spent during the first quarter. At an annual rate this is 85% more than was spent in 1941 and 60% higher than the 1929 figure. Railroads and electric and gas utilities expect to increase their allotments for expansion, while other categories expect to retain their recent rates

Steel Price Situation Debatable; Rises May Be Announced in August

PITTSBURGH — There is no question about steel demand being of such size as to take up all the steel that will be produced during the third quarter — and probably the fourth quarter—but there is a decided uncertainty as to whether all the wrinkles will be ironed out of the steel price situation before early August.

The Administration's plea that a thorough test of operations be undertaken before coal and steel prices are increased had been anticipated both by leading coal and steel companies.

Pittsburgh Consolidation Coal Co., prior to the appeal of President Truman, had set tentative coal prices embodying an increase, subject to revision, depending upon workers' productivity after a test of their efficiency with a higher wage scale.

U. S. Steel Corp., also had indicated, prior to the President's statement, that it would go slow in effecting a steel price increase and in no event would it reach a decision before all cost factors were presented to directors.

Specialty Prices Raised

Specialty steel makers had not been expected to observe determination of a policy on prices by the leading integrated steel companies, and some of them have raised quotations. The first one developed the same day the President asked for delay.

Many steel executives believe steel prices will be increased, but there was no certainty as to the extent of the upturn. First reports that the addition would be an average of $5 a ton represented an amount which leaders in the industry would like to see instituted, but which was no criterion of what will be the ultimate decision.

Second-Quarter Profits

The extent of steel company profits during the second quarter of 1947 became a matter of general interest in view of the claims of higher costs and Administration urgings that increased prices be deferred.

The character of these earnings could not be determined until reports of the more important companies became available recently. The first two steel company reports were unusually strong on the earnings side in view of claims that the second quarter mill workers' wage increases were absorbed.

Wagering on selective price increases was boosted by the President's appeal. It was felt the steel industry could make a good presentation in respect to those finished products where there were little or no profits.

Sheet Demand Heavy

It is no longer believed that a balance of sheet and strip demand will be attained during 1947. The extraordinary volume of orders plus factors which will contribute to maintenance of inventories seem to indicate that there will be an unsatisfied demand in this particular finished steel item until well into the first quarter of 1948.

A few months ago, no one expected that automobile companies would be compelled to shut down in July because of sheet steel shortages. At the same time, some parts makers are reporting that the worst of the steel stringency is over as far as they are concerned.

Check on Cancellations

In view of the prospect of higher prices, consumers will be slow in canceling any tonnages which they may not need.

Purchasing agents generally are reporting they will go slow in their buying once they have rounded out inventories and pipe line to production facilities are filled. This is a story also that is months old.

Tin plate will hold strong for months, and oil and beer can demand will offset any declines which may develop for other types of containers.

There is just a shade of an easier demand in small-sized carbon bars, but not enough to place these sizes in the category of easy-to-buy items. Large bars are available.

Plate Orders Pour In

There is a wide demand for plates, and distribution is being affected by the priority given to railroad car builders. There does not appear to be much new demand for shapes, but warehouses do not seem to be able to get enough. Fabricators have long backlogs for assorted uses.

Nails are still short and so is wire used by the automobile industry. Some wire specialties are easier.

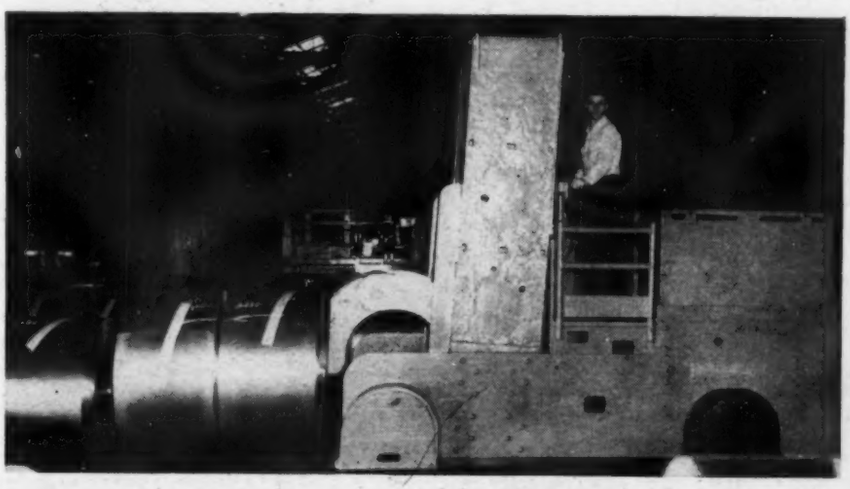
Demand for pipe, with the exception of mechanical, is heavy. Pig iron prices are firmer, and the scrap market is strong.

GM Halts Passenger Car Output To Accumulate Steel Inventory

DETROIT—In an effort to accumulate steel inventories, General Motors halted passenger car production for one week, starting July 20. It is a direct aftermath of the soft coal "holiday" which disrupted steel deliveries.

All fabricating plants of the Fisher Body Division and their assembly plants in Michigan closed. Chevrolet, Pontiac, Oldsmobile, Buick and Cadillac assembly lines in Michigan were idle, with accessory plants.

The General Motors Truck & Coach Division plant of Pontiac and Chevrolet truck operations were not affected, and continued operations. C. E. Wilson, GM president, cited the extreme shortage of sheet steel, and attributed it in large measure to a series of strikes in the coal, steel and electrical industries. General Motors has been unable to obtain ample steel inventories since the end of the war.



Tin Plate Mechanization is complete in that department at Irvin Works of Carnegie-Illinois where a fleet of 47 storage battery-powered trucks are kept busy 22 hr. a day, 7 days a week. The ram truck, above, with a 30,000 lb. capacity, is moving two coils of hot-rolled strip into electric tin-plating process

Impact of Lewis' Newest Contract Significant to Metalworking Firms

WASHINGTON — Management in other industries, particularly in those producing or fabricating steel, cannot place too much emphasis on the significance of the soft coal contract as a guide to their future relationships with their own unions.

There are two things management must examine in the contract John L. Lewis obtained for his United Mine Workers:

- 1. Economic benefits granted the miners.
- 2. Various ways in which the agreement seeks to avoid or conform to the Taft-Hartley labor law.

Both provide clues as to what other unions will demand when their present contracts permit.

Lewis' Economic Figuring

On economic concessions, Lewis claims that, figuring everything, his miners obtained benefits totaling $3.54 a day, or about 44½ cents an hr. He arrived at this by taking into account the $1.20 increased take-home pay from $11.85 to $13.05 a day, the equivalent of 15 cents an hr.; reduction in portal-to-portal hours from 9 to 8; increase in tonnage royalty for welfare fund from 5 cents to 10 cents; and increase in paid lunch period from 15 to 30 minutes.

Lewis' grandiose claims went unquestioned for days. Almost a week passed before President Truman and Irving S. Olds, board chairman of U. S. Steel Corp., revealed the possibility that Lewis' victory, because of compensating factors, might not be all he claimed it to be, or cost as much as appeared on the surface.

There appeared to be no question, however, that less coal would be mined at greater cost. This spelled price increases in coal and in products dependent on coal and steel.

Miners Lead in Wages

The $1.63 hourly rate for miners puts them far ahead of steel, which pays about $1.09, and automobiles, which pays about $1.45. This makes a compelling argument for steel and auto workers to seek a further increase next spring.

Other unions can also be expected to push harder now for welfare or social insurance plans and paid lunch period. U. S. Steel, which spearheaded the capitulation to Lewis, has given Philip Murray, head of the CIO Steel Workers, good reason to believe he can win his social insurance demand now under study by the company and the union. The study is to be completed by Nov. 1.

Other Contracts Merit Study

Meanwhile, other companies having contracts with Murray's union should be doing some studying of their own.

Other unions can also be expected to use the soft coal contract as a model for avoiding many penalties of the Taft-Hartley law by eliminating, no-strike clauses and by requiring disputes to be settled under the contract or through collective bargaining rather than through NLRB or the courts.

Union leaders are giving most attention, however, to a clause which permits Lewis and the miners to suspend the contract terms at will. It states that the contract terms will apply to the miners only when they are "able and willing to work."

Inventor Celebrates Birthday—Wendell P. Norton, inventor of the Norton quick change gear box, recently celebrated his 87th birthday. Former superintendent of the Hendey Machine Co., Torrington, Conn., where he was employed from 1886 to 1917, Mr. Norton was honored on his birthday by David Ayr (at left of Mr. Norton in the above photo), other officials and his former co-workers at Hendey

Coal Settlement Spurs Demands For Ban on National Bargaining

NEW YORK—Today's wave of dissatisfaction over the manner in which the recent coal labor settlement was reached is breeding new demands for a federal curb on industry-wide bargaining.

Despite clamor in Congress for a ban against union demands for single national contracts, no such curb was written into the Taft-Hartley Labor-Management Relations Act.

It was generally agreed that any attempt to do so would weaken chances for passage of the bill over a Presidential veto. The industry-wide bargaining issue was left open by provisions for a further investigation of the problem. It was hoped this gesture would satisfy those who had demanded an outright ban.

Larger Mines Set Pattern

Settlement of the coal issues by larger companies in an effort to avert what they saw to be industrial paralysis and national calamity forced other operators to agree. The latter found themselves committed to an unwanted industry-wide agreement. They signed for the same terms as the bigger and more profitable mines.

Most of the reluctant signers raised prices and dug in for peak operations to continue as long as the market for soft coal absorbs all that can be produced—regardless of price. When the market becomes competitive, they warn, either labor costs will have to drop, or mines will close.

Further Legislation Sought

Pressure is being made for further legislation, aimed specifically at barring industry-wide bargaining. Cooler heads on Capitol Hill warned that another labor curb could not be passed at this session. They pointed out, however, that groundwork can be laid for a vigorous campaign to bar national bargaining in the 1948 Congressional year.

The Taft-Hartley law provides for a 14-member Senate-House Committee on Labor-Management Relations. This group is charged with constant surveillance of how the new law is working out. It will also study, and report to Congress, on ways to make the new labor law a better instrument for guiding labor-management relations.

And it is given certain specific fields for thorough-going inquiry. One is the practicality of prohibiting industry-wide bargaining, or restricting its use.

This Commitee can become a potent force in drafting concrete proposals for legislative relief. Management will undoubtedly urge Committee action against industry-wide bargaining prior to the 1948 Congressional session.

Detroit

STEEL USERS AWAIT REVISION OF SPECS . . . SINGLE STAMPING FOR BUMPER-GRILLE TESTED . . . DIE ORDERING IS ON INCREASE

NE Prefixes to Be Dropped

Major steel users are waiting with interest a forthcoming clarification and revision of specification tables, being prepared jointly by technical men of the Society of Automotive Engineers and the American Iron and Steel Institute.

Chemistry is being changed in numerous instances; some specs are being withdrawn; and others are being added all through the list. SAE and AISI numbers will correspond for the same grade.

The NE prefixes adopted for National Emergency steels during the war will be dropped. So will the bulk of the wartime specs in the lean-alloy category. The 8600 series will largely be retained, but other series will be mostly eliminated.

Steel, as always, is an active area of development. Indicative is the recent listings by SAE of hardenability bands for 62 steels, 25 of these for the first time.

Buying of steel by hardenability rather than chemistry appears to be on the increase. This is true not only in the automotive industry, but in the tractor and farm-implement field.

Specs for Cold-Drawn Steel

In another aspect of the steel picture, note should be made of the efforts being made to develop hard-and-fast specifications for cold-drawn steel. Hitherto, cold-drawn has been limited in applicability because of a general practice of not quoting limits of impact strength and other physicals.

Auto companies believe these physicals can be specified. Particularly is this viewpoint felt at Ford Motor Co., where cold-drawn steel is used for such significant items as spring bolts, propeller shafts, and others. The Ford experience has convinced the rest of the industry that specs can be written for cold-worked steels; and evidently a few of the producer mills believe the project may be feasible. At any rate, SAE has announced the start of a project toward this end.

Integral Bumper-Grille

Something new in automobile bright metal parts may be seen next year if the builders of one of the more expensive cars is satisfied with the outcome of current experimental work.

This maker seeks to employ plain carbon SAE 1020 sheet steel to stamp out an integral bumper-and-grille assembly, in place of spring steel for the bumper and a die-casting for the grille. There is no decision yet whether to make the change.

Stamping of bumpers was first done before the war by Olds, which specified high-strength, low-alloy steels which could be formed in the stamping press.

Aluminum May Replace Zinc

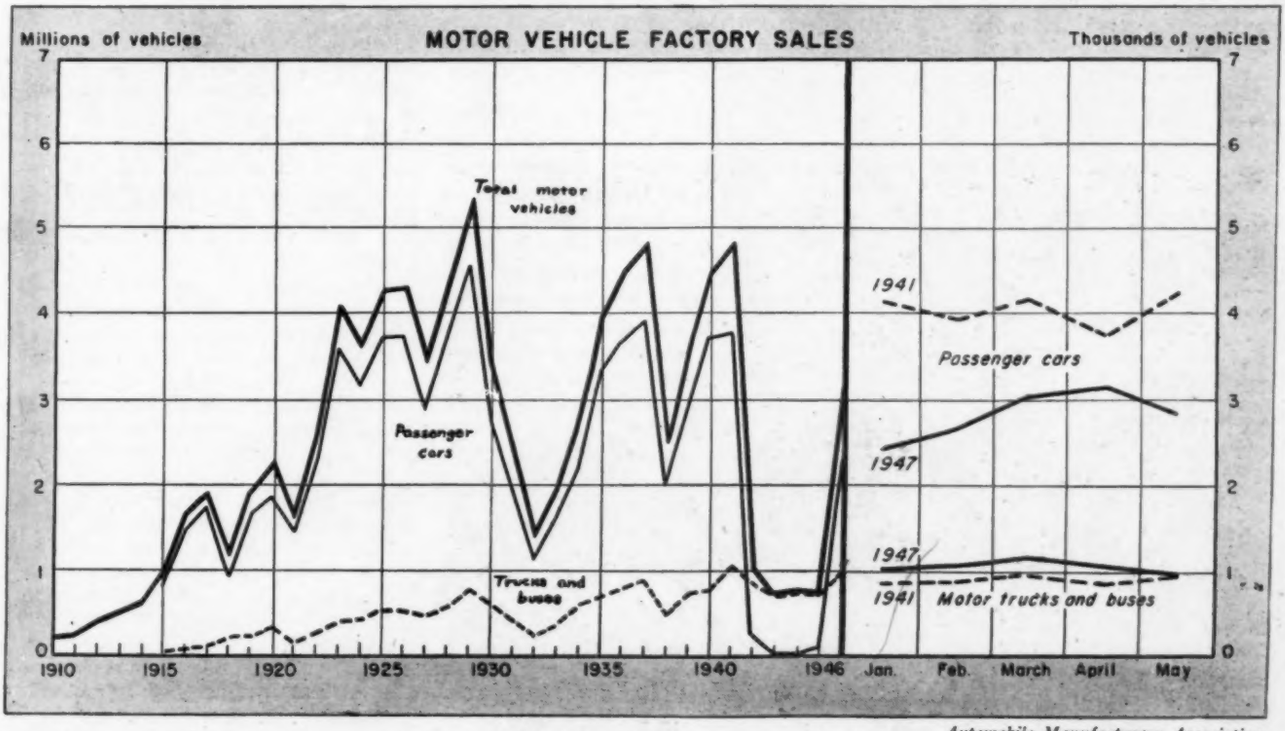
One of the quiet movements which has not yet assumed proportions large enough to be termed a trend is substitution of zinc die-castings by aluminum die-castings. The reason, so often evident as the root of automotive developments, lies in the comparative price of the two metals.

Aluminum's more advantageous price today, however, is somewhat counterbalanced by the fact that zinc castings are easier on dies. This looks as though it had the makings of a dispute between production and engineering.

Modest Rise in Die Orders

Die ordering in general—not alone for castings, but also for stamping work—is modestly on the increase in the Detroit area. Apparently this is reflective of a straggling of releases from automobile companies and others for new model requirements.

Jig and fixture ordering, to this date, has not kept pace with the orders for dies. In general, the Detroit tooling shops continue to operate at levels just above a 40-hr. week, with little prospect of important change one way or another for the next several weeks at least.



Automobile Manufacturers Association

Current Auto Production is approaching 1941 level, while 1947 truck and bus output has exceeded the prewar rate

Supply of Non-Ferrous Metals Shows Improvement; Tin Remains Tight

WASHINGTON — Moderation in industry's scramble for non-ferrous metals at the end of the first half of the year, motivated by nervousness over an unbalanced price situation and the filling of supply lines, has resulted in a return to near-normal buying procedure.

For the first time since price decontrol, non-ferrous consumers are reverting to the normal procedure of placing new business against actual requirements. The supply situation is greatly improved, according to metal market experts.

The end of government allocations and the waiving of the four-cent import tax on foreign copper in May brought a jump in the price of foreign copper to 24 cents. Domestic producers fought to hold the price line at 21½ cents, and as buyer resistance increased, it became evident that the higher price could not be maintained.

21½-Cent Level Holds

Increased offerings of foreign metal at lower prices and a weakening in the scrap market brought enough pressure to return the overall market price to the 21½-cent level. That level has been maintained since June 12, and is expected to stay there for some time.

Foreign buying, which has not been heavy recently, may increase later in the year if foreign dollar credits are built up, it is believed.

Demand for lead remains high, but producers have told consumers that they do not anticipate any change from the present 15-cent price. But it is possible, if imports and production continue at present levels, the price may drop late in the year.

Zinc Demand Lessens

Demand for zinc remains inactive and buying has fallen off slightly. A reduced volume of export business has been predicted because of an increase in competition from foreign producers on the world market.

There is some uncertainty over the price of zinc because of the as yet undecided fate of the Premium Price Plan for Copper, Lead and Zinc, and the possibility of increased labor costs.

The supply of tin remains inadequate because of the slow recovery of oriental producing areas. This condition is expected to contine for a year or more. The metal will remain under governmental control for another year at least. The price remains unchanged at 80 cents a pound.

Chicago Appliance Firms Expand To Meet Heavy Product Demands

CHICAGO — Appliance manufacturers in the Chicago area continue to disclose expansion plans, indicating that they expect demand to hold up for a long time to come.

Pressed Steel Car Co., after spending about $5 million to remodel and retool an unused steel fabricating plant, is turning out several thousand electric ranges a month. Before 1934, the company had used the plant to build railroad and subway cars, and during the war tanks were made in the plant.

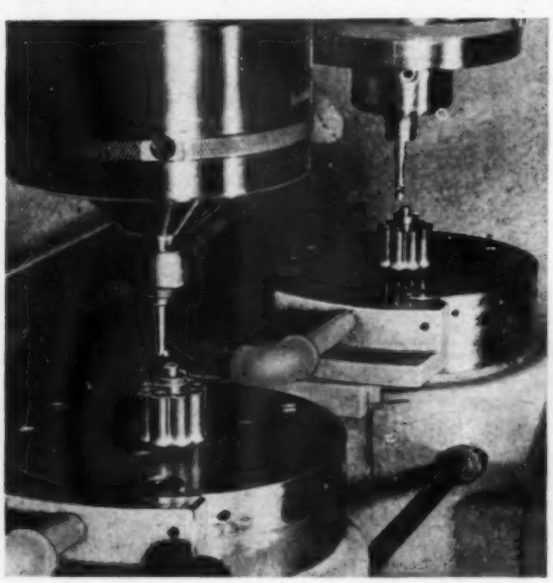
By the end of this year, stove output in the plant will run to 40,000 or 50,000 units, with a 1948 goal of 100,000. Next year the company also expects to expand output to include refrigerators, water heaters, kitchen cabinets, and possibly automatic washers, clothes dryers and dryer cabinets.

Foundry Output Doubled

To boost production, Thor Corporation has just completed a $300,000 improvement program in the company's foundry operations. The result has been a 50% cut in casting costs and a doubling of output. Castings, the company estimates, now cost seven to eight cents a pound (against 15 cents a pound before the new equipment was installed) and steel furnace output has climbed from 25 tons a day to 50.

Conlon-Moore Corp. has designed and engineered a group of new appliances to add to existing lines. They will be marketed when materials and manpower become easier to get, and when competition for sales becomes tougher.

Avoids Tapered Holes—A Mid-West aircraft manufacturer now uses Carboloy cemented-carbide boring bars to machine cylinder holes in a bronze pump-body to 0.0002 in. tolerance and fine finish. Length to diameter ratio of holes is 6:1, which gives rise to taper and chatter if boring-bar material lacks sufficient stiffness. Machine down-time and part rejects have been minimized by the change



FREIGHT CAR SHORTAGE EXPECTED TO GET WORSE

CHICAGO—Metalworking plants in the Chicago area continue to suffer from the freight car shortage, and shipping experts say the lack of freight cars is likely to get worse later this year.

Central Western shippers of all types expect their freight car requirements for the third quarter of this year to aggregate more than 1 million cars, an increase of 3.5% over the comparable 1946 months.

The need for more cars is much more acute in some metalworking lines. For example, farm implement makers expect to use 34% more cars than they did in the latter part of last year. Machinery makers anticipate a need for 10% more cars than they used in 1946.

Naval Aircraft Profits Provision Wins House Passage; Awaits Senate

WASHINGTON—Legislation removing the Vinson-Trammell Act's provisions requiring that 10% of Naval aircraft be procured from Government-owned plants and setting a 12% ceiling on profits on Naval aircraft purchases has passed the House.

The measure was approved last year by the House, but in rush for adjournment for the 1946 political campaigns, missed Senate action. It has general support.

Old Provision "Outmoded"

Rep. Carl Vinson (D., Ga.), coauthor of the act, pointed out that the requirement for manufacturing 10% of Naval aircraft in Government plants is now outmoded. "Years ago, it was needed to furnish the Navy with a yardstick on aircraft costs," Vinson declared, "but private aircraft companies have now demonstrated that they can manufacture planes more economically than the Government."

The 12% profit limitation on Naval plane orders, blocking negotiated developmental contracts, Rep. Paul Kilday (D., Tex.) reported to the House, "actually works to maximize, instead of minimize, profits on naval contracts, since private manufacturers have come to accept the 12% limitation as the standard allowable profit."

Competitive Bids to Continue

The Navy will continue to procure the bulk of its aircraft under competitive bid contracts involving substantial developmental work under the Vinson-Trammell Act amending bill.

Under the bill, now set for Senate approval unless precluded by adjournment, the Navy would be required to manufacture its own aircraft in special instances—where the only aircraft company capable of fulfilling an order refused to offer what was deemed a fair price, or where there was evidence of collusion on the part of aircraft manufacturers to keep Naval contract prices at an unjustifiably high level.

BILL TO RAISE MINIMUM WAGE FAILS TO WIN ACTION

WASHINGTON — Legislation to raise the statutory 40-cent minimum wage standard failed to gain Congressional action because of opposition.

Some Republican Leaders, including House Speaker Martin and Majority Leader Halleck, had hoped they could somewhat appease organized labor, angered by enactment of the Taft-Hartley law, by raising the national minimum wage to 60 cents. This hope was dashed when they ran into opposition within their own party, as well as from Southern Democrats.

At the same time, labor papers openly challenged the maneuver. The attitude of the labor press stung GOP leaders, who thought they could put over the deal.

Rep. Gerald Landis (R., Ind.), author of the 60-cent bill in the House, is considering writing to CIO President Philip Murray, AFL President William Green and others to the effect that if they want the minimum raised they should publicly endorse the GOP-sponsored bill.

If labor leaders will soft-pedal criticism of the Republicans and agree to give them credit for a raise to 60 cents, the House leadership probably would make an attempt to put the bill through next spring.

Bill to Make OTS Permanent Held Over to Next Session

WASHINGTON—The Fulbright Bill (S. 493), establishing a permanent Office of Technical Services in the Department of Commerce is scheduled to receive action at the next session of Congress.

As Congress neared the close of its first session, Senate consideration of the bill was objected to by Sen. Wherry (R., Neb.), thus reducing its possibility of passage by the Senate.

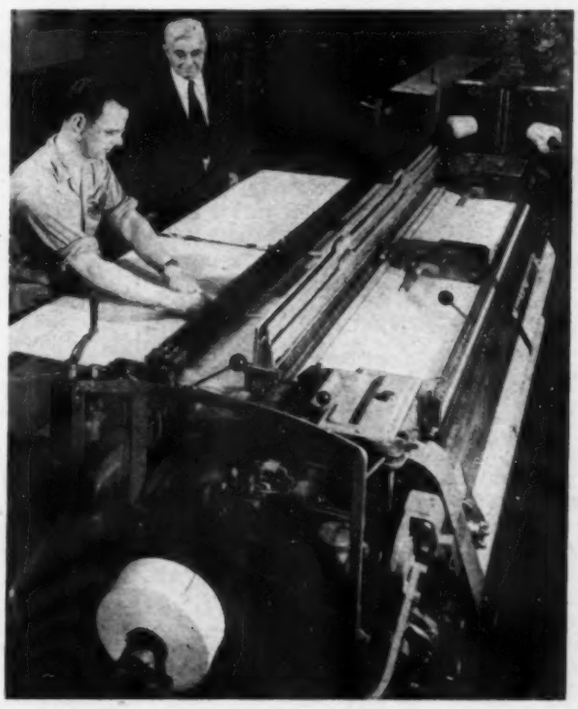
The bill, as reported favorably by the Senate committee on expenditures in the executive departments, eliminated the two most controversial activities contained in the original proposals of Sen. Fulbright, its sponsor. Missing were (1) any authorization for government-financed applied research such as has been carried out by the Industrial Research and Development Division, and (2) the provisions for aid to inventors.

OTS Functions Defined

The two functions which would be performed by OTS under the bill are (1) operation of the information clearing house for evaluation, publication, and dissemination of enemy technical information, and declassified information from U. S. military and governmental sources and (2) operation of an office for recording of inventors' ideas to provide a document with a date of record that would be admissible as evidence.

Even with Senate passage of the measure, it was evident that favorable action by the House at the first session was extremly unlikely.

Meanwhile, OTS has been given an appropriation of $790,000 for fiscal 1948 to continue a minimum program of dissemination of information which it already has microfilmed in its files.



Swiss Shuttleless Loom has been redesigned by Warner & Swasey, Cleveland, which has acquired the American rights to the Swiss Sulzer weaving machine. Five pilot models, now under construction, are expected to be completed during the last months of this year, with production models due for the market in 1949. The machine introduces the filling yarn, drawn from a single "cheese" of yarn (immediate foreground) by a gripper which eliminates the necessity for bobbin winding and use of a shuttle which usually rides on the yarn

WAA Moves for Firm Inventory of Surplus Machine Tools

WASHINGTON — The surplus machine tool cataloging program of War Assets Administration is a concrete step in placing the disposal operation on a business-like and efficient basis.

When cataloging is completed, WAA will have a national inventory of everything in its possession for the first time in its history. It is expected to eliminate confusion in locating and obtaining surplus machine tools.

Any sales project as tremendous in size and scope as disposal of surplus from World War II is bound to draw criticism. WAA hasn't been spared and admits some is well-taken, but a substantial quantity has come from sources which are ill-advised and unfamiliar with problems facing the agency.

SALES OF MACHINE TOOLS
By Types of Buyer
July 1946 through March 1947
(In thousands)

	Reported Cost	Sold For
Federal Government	$5,343	$2,479
State & Local	4,575	814
Manufacturers & Industrial Users	260,078	94,898
Distributors	36,791	7,894
Exporters	2,903	1,032
Foreign Gov'ts	851	392
UNRRA	613	267
Veterans	9,918	4,004
Unclassified	4,586	1,561
TOTAL	325,658	113,341

Because of the important effects—economic and otherwise — encompassing disposal of surplus machine tools, AMERICAN MACHINIST went directly to WAA Administrator R. M. Littlejohn for the answer to specific questions. The questions and answers are presented on page 125.

Merchandising Policy Taken

The cataloging program, launched in the Detroit region in March, was precipitated as a fundamental step in selling merchandise: To know what you have; and be able to sell and ship accurately after receipt of an order.

When catalogs for each district are completed, all regional offices will have them available and prospective buyers will be able to locate and order from them.

All items will be offered subject to prior sale. The regional offices will make weekly deletions and additional catalogs of new surplus items will be issued periodically.

Detroit Test Successful

WAA officials point to the success of the cataloging experiment in the Detroit area as proof of its operational advantage throughout the country. The catalog system will give JANMAT (Joint Army Navy Machine Tools) a better picture of what surplus is available for tagging for reserve.

Administrator Littlejohn is convinced catalog sales will save the public money. He cited advertising costs of ¾ of 1%, compared with sales commissions of 12½ and 17% on the new resale program.

WAA spokesmen have been unhappy about the 12½% commissions for approved dealers. They claim dealers are disposing of the easy-to-sell material, and leaving the harder items for WAA to sell.

Dealer Commissions Scored

As a matter-of-fact, some officials favor discontinuance of payments to dealers, because they can't be administered effectively or policed properly. It has also been suggested that discounts be allowed dealers only after 30 days of prior offering.

WAA estimates it has sold approximately $637 million worth of machine tools (acquisition cost) to date. While release of a third fixed-price register has been considered, no action will be taken until the cataloging program is completed.

SALES OF MACHINE TOOLS
By Type of Sale
July 1946 through March 1947
(In thousands)

	Reported Cost	Sold For
Clayton Formula & Fixed Price	$124,178	$44,790
Negotiated Sale	9,872	2,874
Sealed Bid	9,732	912
Auction	104	12
Spot Sale	20,469	5,619
By Approved Dealers	160,399	59,019
Unclassified	904	115
TOTAL	325,658	113,341

SURPLUS MACHINE TOOL
DISPOSALS, SALES AND RECOVERY RATES
(Thousands of Dollars)

Period	Total Disposals	Sales		Recovery Rate
		Reported Cost	Sold For	
Cumulative thru June, 1945	$27,711	$27,665	$15,508	56.1
July	3,268	3,105	1,552	50.0
August	3,436	3,000	1,017	32.0
September	2,287	2,510[a]	1,031	41.1
October	6,261	6,112	2,782	48.5
November	11,316	10,403	5,123	49.2
December	16,793	17,686[a]	8,353	47.2
January, 1946	20,229	20,135	9,491	47.1
February	19,578	19,416	9,313	48.0
March	40,417	40,062	19,264	48.1
April	30,831	29,570	13,614	46.0
May	35,078	30,757	14,415	46.9
June	45,431	43,088	20,502	47.6
July	22,718	21,188	9,623	45.5
August	33,093	31,291	14,237	45.4
September	33,140	28,648	13,212	46.1
October	42,210	35,561	15,891	44.7
November	39,785	36,222	14,006	38.7
December	48,939	47,576	14,556	30.6
January, 1947	60,478	58,374	15,696	26.9
February	33,002	32,910	8,554	26.0
March	33,108	32,480	7,728	22.8
April	34,138	23,859	5,619	23.6
May	42,060	33,905	7,439	21.9
TOTAL	$685,307	$635,523	$248,526	39.1

[a]—*Sales exceed total disposals because of adjustments in transfer to scrap*
Prepared by: Reports Division, War Assets Administration

WAA Administrator Littlejohn Answers Our Questions

Surplus machine tool disposal has been a burning question for more than two years. A series of questions were propounded by AMERICAN MACHINIST and directed to WAA Administrator R. M. Littlejohn. The questions and his answers follow:

Q: We understand Sen. Ferguson's committee asked WAA how long it would take to produce catalogs of machine tools in several major warehouses, as a test operation, with a view to clearing out other surplus property by that means. Has WAA arrived at an answer?

A: In March of this year we embarked on a policy of cataloging all of the machine tools in the Detroit Region and some weeks ago we adopted the same policy for all of our other Regions. Detroit has now issued 16 catalogs, listing approximately 22,000 machine tools. They have 2 more catalogs to issue. These catalogs contain a description of the tool, price, and the location in the warehouse of each item. It has increased the sales of machine tools in the Detroit Region and we are convinced that this cataloging presents the best answer to wide distribution of this type of surplus.

Q: Is the Administrator in favor of such a test? Is he in favor of a general shift from firming of invoices to a catalog plan?

A: Our experiences in Detroit fully justify the extension of this policy in other Regions.

Q: Would preparation of the catalog take as long as invoicing? And wouldn't many items be out of stock by publication time and soon thereafter?

A: Catalogs are prepared from our Form WAA-4, which is probably what is meant by "invoicing." The WAA-4's, of necessity, must be prepared prior to the catalog. All items are offered subject to prior sale and the offices publish weekly deletion lists to keep the catalogs up-to-date. The buying public, therefore, has an up-to-date picture of the inventory of each office without requiring a search of our WAA-4's or invoices for each inquiry. This search took so much time that it was unsatisfactory to the public and to WAA.

Q: Some WAA officials appear to believe that both the invoice and the catalog are too slow and that extreme simplification is in order. In other words, sell the goods, keep the sales slip, and bookkeep later. What's the matter with that?

A: Any method of inventorying quantities as large as those of War Assets is, of course, time-consuming. We believe, however, that the fundamental steps in selling merchandise are: first, to know what you have; and to be able to sell and ship accurately after receipt of an order. When you consider that our machine tool stocks cover many acres of floor space, it will be apparent why it was unsatisfactory to the public and ourselves to try to locate the type of machine a customer desired before we undertook the program of careful indexing and cataloging, which we are following.

Q: We understand that perhaps a billion dollars' worth of machine tools will still come into surplus from unsold and unleased plants, from RFC, Army, and Navy. What can possibly be done with such a volume of machines?

A: The number of tools or dollar values still to come is an undetermined figure. It is clear, however, that the number of tools will not be nearly as great as originally estimated. The present demand for our surplus tools continues very great and for some types we have not been able to fill the demand. We have sold to date about $367 million worth of machine tools (acquisition cost) which has been a tremendous task. The number which we can sell in the future in part will depend in large measure on the type of tool which comes to us. You must remember, of course, that in addition to the normal market, we have outlets to JANMAT, to educational and public health institutions, state and local governments, etc. Their response to our cooperation has been very gratifying and we believe that a substantial quantity of tools will be sold through this program.

Q: Did you, General Littlejohn, consider release of a third fixed-price register? Was it prepared? If so, why wasn't it released? Will it be released?

A: Release of a third fixed-price register has been carefully considered but no action will be taken at the present time until we have a thorough analysis as a result of our catalog offerings. Our machine tool stock is an important national asset if properly administered, or it may become a national liability if unwisely handled. It has cost our taxpayers a tremendous sum of money and it can add greatly to our national welfare by proper distribution in channels of production, public education, and as a reserve of tools which do not readily go into the above categories for national emergency purposes. If, however, those tools which were produced in large volume for war purposes but have a limited demand for peacetime use are sold so cheaply to speculators that they will hang over the market for many years to come, this would serve to depress an industry which is important to this country in both peace and war.

Q: Some persons, who consider themselves informed, claim the estimated 40% recovery on machine tools is an illusion—that counting all costs there is *no* recovery, or a loss. If this is so, the only object in disposition is to place the machines with industry, create the reserve and create scrap. If that's true, what is the good of so much bookkeeping?

A: We do not agree that the estimated 40% recovery on machine tools is an illusion. A substantial recovery is received by the Government despite costs of shipping and warehousing. Accounting or recording of public property is and, of necessity, must be complete and thorough. Experiences of the Government over many years have led to certain requirements of recordkeeping which must be adhered to regardless of the recovery rate.

Q: Can we predict at this time when WAA will liquidate the machine tool program?

A: By the end of the calendar year we should have a firm plan for complete liquidation so that all the machine tools can be liquidated by the end of the fiscal year, July 1, 1948. We should be able to liquidate the present inventory by the end of March, 1948, and April, May, and June of 1948 will be utilized in cleaning up the machine tools which have yet to be declared to WAA and are not in our present inventory.

Q: When will WAA have a firm inventory on machine tools?

A: Approximately 30 days. (Ed. note: This would mean the early part of August.)

Q: How long will it take all Regions to catalog the machine tools and offer these catalogs to the public?

A: 60 to 90 days.

Q: What is the cost of cataloging as compared to the present dealers commission?

A: The present commission to dealers is 12½%. If we sell by catalog, the best estimates indicate it will cost us less than ½ of 1%.

Industrialists View Navy Tests On Latest Ordnance Developments

WASHINGTON—About 50 members of the Navy Industrial Association witnessed a series of ordnance tests recently at the Navy Proving Grounds, which includes an expanse of the Potomac River estuary south of Washington in Virginia.

Main event was close-range firing of a blank 16-in. gun projectile at a sample of 17-in. armor steel, made by Crucible. The shells opened a hole in the plate, but bounced back (did not get inside to explode) and the plate won the round.

Projectile Velocities Measured

Steel makers and other Navy suppliers saw the measurement of several projectile velocities. The slug first magnetized, is aimed through two "rings" a measured distance apart. The rings are insulated copper wire solenoids, in which the magnetized projectile sets up an electrical potential as it passes through. Time between rings gives the velocity.

Low Temperature Tests

Dahlgren and other Navy laboratories are conducting many low temperature tests, with a view to Arctic operations. These include lubricant fuels, chemicals, starting with engines, and the effect of minus 60-70° on materials.

Surface-hardened aluminum and steel armor plate are further hardened and thus improved, by extreme cold. Inside metal is not hardened enough to impair its toughness.

16% Increase In Freight Rates Urged For Iron, Steel Items

WASHINGTON—The nation's railroads, in requesting the Interstate Commerce Commission to sanction freight rate increases averaging 16%, have established a set of increase limitations for certain iron and steel commodities and several raw materials used in foundries.

The petition, filed July 3, proposes to increase rates on iron and steel commodities and foundry raw materials as follows: railway car or locomotive axles, many specific iron and steel manufactured articles, scrap, nails, spikes, staples, pig iron, rails and railway track materials, tin plate scrap, black plate scrap, trucks, car and locomotive frames and wire. The requested maximum increase is 7¢ per 100 lb., but not in excess of $1.40 per ton, net or gross as rated. Foundry sand is held to an increase of 40¢ per net ton, maximum.

Production Time Reduced 50% on manufacture of concrete mixers for huge building projects by using welded fabrication instead of riveting and bolting. All seams and entire discharge end are double butt-welded for added strength. Built by the Jaeger Machine Co., Columbus, Ohio, the 8 cu. yd. mixer is constructed of four 1/4 in. carbon steel plates; measures 86 in. in dia. and 27 in. high

Poland Seen as Large Market For U. S. Industrial Equipment

NEW YORK—Poland is setting up a new economy which will provide a market for American machinery and industrial equipment. A new industrial outlook came about when Poland received a slice of industrialized area from Eastern Germany at the end of the war.

Rehabilitation of Poland's industry is just getting underway. Much of its basic raw material industry is back into production. Poland needs machinery for agriculture, coal and metal mining, power utilities, steel and rolling mills, metal smelters, transportation and communications, and construction of plants, roads and public works.

When a program for modernizing coal mines is completed, output is expected to exceed 100 million tons a year. Zinc production this year will total about 100,000 tons, with a by-product production of about 15,000 to 20,000 tons of lead.

There are also expansion plans underway for iron and nickel mining and smelting, and copper mining.

Scrap Metal Available in Bay

WASHINGTON — Approximately 100,000 tons of reclaimable scrap iron, steel, and non-ferrous metals, in the form of surplus and war-damaged LST's, tankers, cargo ships and numerous small craft, are available at Subic Bay, in the Philippines, according to a recent Navy report on scrap in the Pacific.

There are several "catches" to the proposition, however. Although the ships are afloat, there are no ship-breaking facilities in Subic Bay.

Murray of Armco Will Attend International Labor Conference

MIDDLETOWN, OHIO—C. H. Murray, vice president of The American Rolling Mill Co., has been named by the U. S. Department of Labor as a principal delegate for the International Labor Conference in Stockholm, Sweden, from Aug. 19 to Sept. 21. He will represent the iron and steel industry.

Mr. Murray, who will sail for Sweden on Aug. 8, represented the steel industry at the International Labor Conference in Cleveland a year ago.

The ILO aim is to improve industrial and employment security in all countries by drafting international legislation based on research, discussion and conferences. It seeks to eliminate low working standards which adversely affect international trade relations.

4 Industrial Finishing Trends Command Interest at Exposition

DETROIT—Four distinct trends in industrial finishing captured interest of 40,000 visitors to the American Electroplaters' Industrial Finishing Exposition held recently. The trends:

1. Current polarity reversal in connection with copper plating.
2. Spray application of water-emulsion buffing compound to wheels in place of grease stick application.
3. Plastics for racks, tank linings, and plating barrels.
4. Automatic and semi-automatic machines for complete cleaning, pickling and plating operations according to desired preset cycles.

Current polarity reversal involves applying plating current with one polarity for a measured time interval (say 12 sec.) then reversing polarity for, perhaps, 4 sec. In the first instance, copper is deposited; in the second, copper is deplated.

Smoother Distribution Claimed

It is said that the deplating portion of the cycle "eats away" the high spots, and removes copper at points where current density builds up. Claimed result is a smoother, more even distribution of copper protective underlay, minimizing surface preparation before nickel plating.

Emulsion buffing compounds are sprayed onto buffs by air pressure under automatic or pedal control. Dollar savings in compound and buffs reach 40% on some work, and operators need not lay down work to apply grease stick to the wheel.

Plastic Coatings Shown

Plastic coatings for lining tanks, protecting duct work, and covering racks were shown by several firms. These materials are inert to attack by alkalis and acids.

Altogether, the show's 140 displays were worth perhaps $500,000, and some pieces of equipment weighed 10 or more tons. There were visitors from England, Sweden, Switzerland, France, and South America.

The exposition was timely in that none had been held in 12 years, and in the meantime the metal-finishing industry has grown to an annual business of $300 million.

Ryan Acquires Navion Rights

SAN DIEGO, CALIF.—Following the recent agreement wherby Ryan Aeronautical Co. required from North American Aviation, Inc., all design and manufaucturing rights, production tooling, work-in-process, and spare parts, the Navion four-place personal and executive planes will come off Ryan production lines in about two months. Movement of equipment and materials to Ryan is expected to be finished by Sept.

Names in the News

Frank U. Hayes

E. P. Blanchard

Frank U. Hayes, assistant sales manager of the Bullard Co., Bridgeport, Conn., for the past five years, has been named sales manager, succeeding **E. Payson Blanchard,** who has been named director of sales.

Col. A. E. Higgins has been named vice president of Rockwell International Corp., New York, with offices in the Empire State Bldg. Prior to the war, Col. Higgins was associated with Pittsburgh Equitable Meter Div. of Rockwell from 1937 to 1942.

Owen G. Watterman has been appointed sales manager at Zagar Tool, Inc., Cleveland.

Ralph W. Rausch has been appointed chief engineer at the Pershing Rd. plant of Link-Belt Co., Chicago, succeeding **C. S. Huntington,** retired.

P. O. Peterson

E. M. Douglas

P. O. Peterson, director of purchases of the Studebaker Corp., South Bend, Ind., has been named vice president in charge of manufacturing, succeeding **Ralph A. Vail,** who retired after 43 years in the auto industry. **E. M. Douglas,** executive engineer since 1942, has been named vice president of manufacturing for Studebaker-Pacific, succeeding **Stanley Whitworth,** who has retired; and **George E. Westphal** succeeds **Bert Fowler** as general factory superintendent at South Bend.

J. M. Ellis, general manager of sales of Bethlehem Steel Co., Bethlehem, Pa., and **M. C. Schrader,** former assistant to the general manager, have been appointed assistants to the vice president, while **K. L. Griffith,** assistant general manager of sales, has been appointed to succeed Mr. Ellis. **D. C. Roscoe,** manager of sheet and strip sales, has been named assistant general manager of sales and **A. T. Hunt,** former manager of galvanized sheets and former products sales, succeeds Mr. Roscoe.

Frank J. Atwood, director of procurement, inventory control and traffic of Remington Rand, Inc., has also been named a vice president.

Stanley Bracken, executive vice president of Western Electric Co., New York, has been elected president to succeed **Clarence G. Stoll,** who will retire on Sept. 30. Mr. Stoll has been president since 1940 and has been associated with Western Electric for 44 years. Mr. Bracken, who joined the company in 1912, has served in many positions and was elected executive vice president last month.

Stanley Bracken

Paul Rhodes has been named purchasing agent for the Hyster Co., Portland, Ore.

Robert O. Bullard has been named manager of the metallurgy division of the General Electric Chemical Dept., Pittsfield, Mass.

Reginald G. Standerwick and **W. A. D. Evans** have retired from General Electric Co. Mr. Standerwick, engineer of the firm's Aircraft Gas Turbine Div. at Lynn, Mass., was in charge of the development of the I-16 jet engine and the I-40, while Mr. Evans was consultant on electrical discharge lamps in the Administration Div. of the Lamp Dept. for the past six years after 38 years' association with the lamp industry.

Robert O. Dehlendorf, for the past two years eastern district manager for the Emerson Electric Mfg. Co., has joined the sales staff of Jack & Heintz Precision Industries, Inc., Cleveland, as eastern district sales manager of the Electric Motor Div.

B. H. DeLong

G. B. Luerssen

Berton H. DeLong has been appointed vice president and technical director of The Carpenter Steel Co., Reading, Pa., while **George B. Luerssen** was named chief metallurgist, a post held by Mr. DeLong until his promotion.

S. R. Ives has been elected president of Armco Drainage and Metal Products, Inc., Middletown, Ohio. while **M. C. Patton** has been elected executive vice president and **H. D. Neill**, vice president in charge of sales.

John H. Biggs, formerly of the New York office, has assumed his new duties as Rochester representative for Brown & Sharpe of New York, Inc. He succeeds **Earl P. Leeds**, who has joined the general sales staff of the Brown & Sharpe Mfg. Co., Providence.

Preston M. Postlethwaite has been appointed manager of the electrical and automotive divisions of the Wagner Electric Corp. branch at Portland, Ore.

A. R. Collins has been appointed head of manufacturing and engineering of the Stewart-Warner Corp.'s South Wind heater plant at Indianapolis.

B. E. Rogers has been appointed works manager of the Western Cartridge Co. division of Olin Industries, Inc., East Alton, Ill. Mr. Rogers was formerly general superintendent of the wartime United States Cartridge Co.

Henry Dersofi has been appointed manager of material assembly of American Car and Foundry Co., New York. He replaces **S. S. Dunn**, who recently retired.

Carl B. Pollack, manager of the Breckenridge, Pa., plant of Allegheny-Ludlum Steel Corp., Pittsburgh, has been appointed production manager of the company.

H. C. Wallace has been appointed manager of the Louisville district for Air Reduction Sales Co., New York. Mr. Wallace has been in the Louisville district since joining Air Reduction in 1929.

BUSINESS ITEMS

The Herbrand Corporation, Fremont, Ohio, has appointed **Lynn and Brooks** as its West Coast sales representatives. With offices in Los Angeles and San Francisco and Portland, they will cover the California, Arizona, Nevada, Oregon, Washington and Western Idaho territory. **The Herbrand Corp.** and the **Bingham Stamping Co.**, Toledo, Ohio, have merged and future operations will be conducted under the name of **The Bingham Stamping Company.**

Hannifin Corporation, Chicago, Ill., has appointed **The Ridley Co.**, San Francisco, Calif., as its representative for its equipment in northern California.

The A. B. Farquhar Co. has announced the establishment of a sales office in Washington, D. C., 1009 Washington Gas Light Bldg., 11th & H Sts., N.W., with **C. R. Heller** in charge.

Lupomatic Industries, Inc., has been organized to take over the operations of the former **Lupomatic Tumbling Machine Co., Inc.**, which was established in 1906. The offices and plant will remain at 4501 Bullard Ave., Bronx, N. Y.

General Electric's Chemical Dept. has completed a new plant in Pittsfield, Mass., for the manufacture of magnesium oxide.

Jewell Alloy & Malleable Co., Inc., has been incorporated in Buffalo. Incorporators are **Ralph T. Ryeroft, Sr., Ralph T. Ryeroft, Jr.**, and **Ward H. Kendrick.**

The Kent Cliff Laboratories, Peekskill, N. Y., has been formed by **David F. Sklar**, formerly with **Wilson Mechanical Instrument Co.** The organization is available for consultation, development and the manufacture of hardness testing equipment and associated apparatus.

Calco Machinery Company, Philadelphia, Pa., has been appointed agent for **Reed-Prentice Corp.** in the Philadelphia territory.

Vascoloy-Ramet Corp., North Chicago, Ill., announces the opening of two new branch offices and the appointment of a new manufacturer's agent for the southern industrial area, the **Tool Engineering Service**, Birmingham, Ala. **Frank H. Scheffler** will head the Houston, Texas office, and **Dean R. Cline** will head the new office at Davenport, Iowa.

Automatic Screw Co., Los Angeles, has been purchased by the **Deutsch Co.**, Los Angeles.

OBITUARIES

Sanford J. Locke, assistant chief engineer U. S. Hoffman Steel Co., Syracuse, N. Y., died of a heart attack July 2. He had been associated with the company for 27 years.

Edward H. Kelly, 58, died July 30. He was retired general superintendent of the Small Arms Div. of the Colt's Mfg. Co., Hartford, Conn., to which post he was appointed in 1919. He had been with the company 58 years.

Thomas Clive Delaval-Crow, 61, for 26 years chief engineer of the New Departure Div. of General Motors, Bristol, Conn., died June 28. He joined New Departure in 1914 and had been chief engineer since 1921.

Walter F. Henly, retired sales manager of the New York office of the Hendey Machine Co., Torrington, Conn., died July 13.

William O. Carley, 82, who established the Colfax Iron Works, Colfax, Wash., and the Walla Walla Iron Works, Walla Walla, Wash., died July 9.

MEETINGS

American Society of Mechanical Engineers. Fall meeting. Hotel Utah, Salt Lake City, Utah. Sept. 1-4. Ernest Hartford, executive assistant secretary, 29 W. 39 St., New York.

Instrument Society of America. Annual conference and exhibit. Hotel Stevens, Chicago. Sept. 8-12. National office, 1117 Wolfendale St., Pittsburgh.

Machine Tool Congress. Evening meetings in conjunction with the 1947 Machine Tool Show of the National Machine Tool Builders' Association:

American Foundrymen's Association. Sept. 19.

American Machine Tool Distributors Association. Hotel LaSalle. Sept. 17.

American Society of Mechanical Engineers. Hotel Continental. Sept. 18 and 24.

American Society of Tool Engineers. Sept. 19.

Chicago Technical Societies Council. Sept. 23.

National Electrical Manufacturers Association. Palmer House. Sept. 22.

Society of Automotive Engineers. Hotel Knickerbocker. Sept. 25.

National Machine Tool Builders Association. Machine Tool Show. Dodge-Chicago plant, Chicago. Sept. 17-26. Tell Berna, general manager, 10525 Carnegie Ave., Cleveland.

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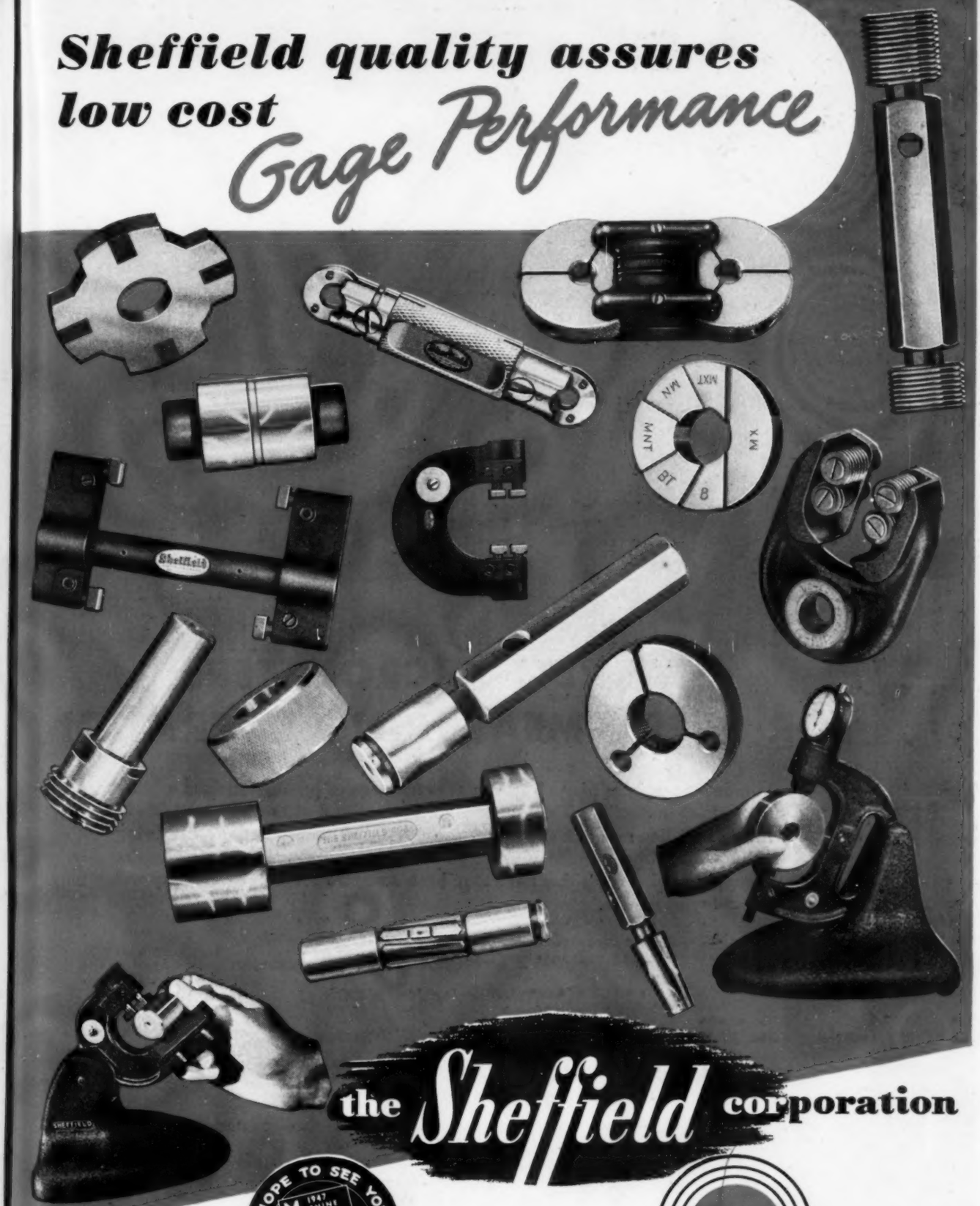

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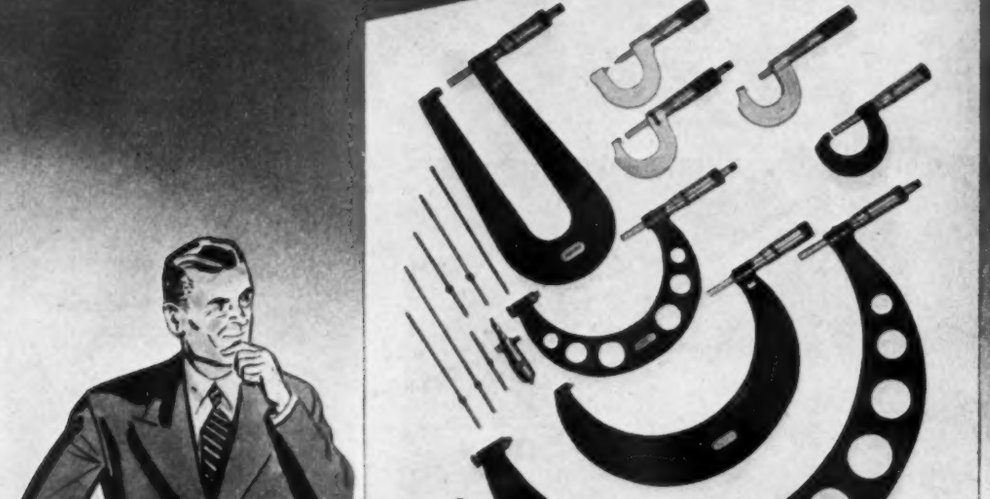

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Carbon Steel for Forging—I

AS PART of its effort to standardize and simplify grades of steel, the General Technical Committee of the American Iron & Steel Institute has issued a revised Section 2 of the Steel Products Manual entitled "Semifinished Carbon Steel Products for Forging."

Forging quality semifinished steel is produced for applications involving forging, heat-treating or similar uses. Such applications require manufacturing control for chemical composition, deoxidation, mold practice, pouring, rolling, discard, cooling, surface preparation, testing and inspection. Rimmed, capped, semikilled or killed carbon steels are produced in this quality, dependent on chemical composition, manufacturing facilities and end uses. When required austenitic grain size may be specified in killed steels as either coarse (grain size 1 to 5 inclusive) or fine (5 to 8 inclusive) to be determined in accordance with ASTM specification E 19 of latest issue.

Manufacturing Practices

Blooms, billets and slabs comprise the primary group of steel mill products designated as semifinished. For forging, these are hot-rolled to approximate cross-sectional dimensions. They are cut either to specified piece weights or to specified lengths, but not to both. Cross sections are designated in inches and fractions without tolerances. Size distinctions are: billets and blooms —not less than 4x4 in.; slabs—minimum cross-sectional area 16 sq. in., minimum thickness, 2 in.

Approximate corner radii for billets are: 4 in. to but excluding 4½ in.—corner radius, ⅜ in.; 4½ to 5 in., inclusive, ¾ in.; over 5 in.—from approximately a square corner to about ⅛ in. per inch of side measurement.

Semifinished material may be ordered in specific lengths or ranges of length in feet and inches. Permissible variation from specified length is governed by weight and is subject to the permissible variation in weight.

When multiple lengths are ordered, the specified lengths shall include the amount required for any loss in parting the desired number of units, which amount will vary with the method used for parting.

Permissible variation from the specified or theoretical weight of blooms, billets and slabs is 5%, plus

LADLE CHEMICAL RANGES AND LIMITS

TABLE I—BASIC OPEN HEARTH CARBON STEELS

(Steels shown in bold face type are commonly used for Semifinished Products for Forging)

AISI No.	Chemical Composition Limits, per cent				SAE No.
	C	Mn	P Max.	S Max.	
C-1005	0.06 Max.	0.35 Max.	0.040	0.050	—
C-1006	0.08 Max.	0.25/0.40	0.040	0.050	1006
C-1008	**0.10 Max.**	**0.25/0.50**	**0.040**	**0.050**	**1008**
C-1010	**0.08/0.13**	**0.30/0.60**	**0.040**	**0.050**	**1010**
C-1012	**0.10/0.15**	**0.30/0.60**	**0.040**	**0.050**	—
C-1013	0.11/0.16	0.50/0.80	0.040	0.050	—
C-1015	**0.13/0.18**	**0.30/0.60**	**0.040**	**0.050**	**1015**
C-1016	**0.13/0.18**	**0.60/0.90**	**0.040**	**0.050**	**1016**
C-1017	**0.15/0.20**	**0.30/0.60**	**0.040**	**0.050**	**1017**
C-1018	0.15/0.20	0.60/0.90	0.040	0.050	1018
C-1019	**0.15/0.20**	**0.70/1.00**	**0.040**	**0.050**	**1019**
C-1020	**0.18/0.23**	**0.30/0.60**	**0.040**	**0.050**	**1020**
C-1021	0.18/0.23	0.60/0.90	0.040	0.050	—
C-1022	**0.18/0.23**	**0.70/1.00**	**0.040**	**0.050**	**1022**
C-1023	**0.20/0.25**	**0.30/0.60**	**0.040**	**0.050**	—
C-1024	0.19/0.25	1.35/1.65	0.040	0.050	1024
C-1025	**0.22/0.28**	**0.30/0.60**	**0.040**	**0.050**	**1025**
C-1026	0.22/0.28	0.60/0.90	0.040	0.050	—
C-1027	0.22/0.29	1.20/1.50	0.040	0.050	1027
C-1029	0.25/0.31	0.60/0.90	0.040	0.050	—
C-1030	**0.28/0.34**	**0.60/0.90**	**0.040**	**0.050**	**1030**
C-1033	0.30/0.36	0.70/1.00	0.040	0.050	1033
C-1034	0.32/0.38	0.50/0.80	0.040	0.050	1034
C-1035	**0.32/0.38**	**0.60/0.90**	**0.040**	**0.050**	**1035**
C-1036	0.30/0.37	1.20/1.50	0.040	0.050	1036
C-1038	0.35/0.42	0.60/0.90	0.040	0.050	1038
C-1039	0.37/0.44	0.70/1.00	0.040	0.050	—
C-1040	**0.37/0.44**	**0.60/0.90**	**0.040**	**0.050**	**1040**
C-1041	0.36/0.44	1.35/1.65	0.040	0.050	1041
C-1042	0.40/0.47	0.60/0.90	0.040	0.050	1042
C-1043	**0.40/0.47**	**0.70/1.00**	**0.040**	**0.050**	**1043**
C-1045	**0.43/0.50**	**0.60/0.90**	**0.040**	**0.050**	**1045**
C-1046	**0.43/0.50**	**0.70/1.00**	**0.040**	**0.050**	**1046**
C-1050	**0.48/0.55**	**0.60/0.90**	**0.040**	**0.050**	**1050**
C-1051	0.45/0.56	0.85/1.15	0.040	0.050	—
C-1052	0.47/0.55	1.20/1.50	0.040	0.050	1052
C-1054	0.50/0.60	0.50/0.80	0.040	0.050	—
C-1055	**0.50/0.60**	**0.60/0.90**	**0.040**	**0.050**	**1055**
C-1057	0.50/0.61	0.85/1.15	0.040	0.050	—
C-1059	0.55/0.65	0.50/0.80	0.040	0.050	—
C-1060	0.55/0.65	0.60/0.90	0.040	0.050	1060
C-1061	0.54/0.65	0.75/1.05	0.040	0.050	—
C-1062	0.54/0.65	0.85/1.15	0.040	0.050	1062
C-1064	0.60/0.70	0.50/0.80	0.040	0.050	1064
C-1065	0.60/0.70	0.60/0.90	0.040	0.050	1065
C-1066	0.60/0.71	0.85/1.15	0.040	0.050	1066
C-1069	0.65/0.75	0.40/0.70	0.040	0.050	—
C-1070	0.65/0.75	0.60/0.90	0.040	0.050	1070
C-1071	0.65/0.76	0.75/1.05	0.040	0.050	—
C-1074	0.70/0.80	0.50/0.80	0.040	0.050	1074
C-1075	0.70/0.80	0.40/0.70	0.040	0.050	—
C-1078	0.72/0.85	0.30/0.60	0.040	0.050	1078
C-1080	0.75/0.88	0.60/0.90	0.040	0.050	1080
C-1084	0.80/0.93	0.60/0.90	0.040	0.050	—
C-1085	**0.80/0.93**	**0.70/1.00**	**0.040**	**0.050**	**1085**
C-1090	0.85/1.00	0.60/0.90	0.040	0.050	1090
C-1095	0.90/1.05	0.30/0.50	0.040	0.050	1095
B-1006	0.08 Max.	0.45 Max.	0.07/0.12	0.060	—
B-1010	0.13 Max.	0.30/0.60	0.07/0.12	0.060	—

COURTESY AMERICAN IRON & STEEL INSTITUTE

for higher production in the automotive industry

Surface broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

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Surface Broaching

FOOTBURT PATENTED TOOTH FORM

Carbon Steel for Forging—II

LADLE CHEMICAL RANGES AND LIMITS

TABLE II — BASIC OPEN HEARTH RESULPHURIZED STEELS

(Steels shown in bold face type are commonly used for Semifinished Products for Forging)

AISI No.	C	Mn	P Max.	S Max.	SAE No.
C-1106	0.08 Max.	0.30/0.60	0.045	0.08/0.13	—
C-1108	0.08/0.13	0.50/0.80	0.045	0.07/0.12	—
C-1109	**0.08/0.13**	**0.60/0.90**	**0.045**	**0.08/0.13**	**1109**
C-1110	0.08/0.13	0.30/0.60	0.045	0.08/0.13	—
C-1111	0.08/0.13	0.60/0.90	0.045	0.16/0.23	—
C-1113	0.10/0.16	1.00/1.30	0.045	0.24/0.33	—
C-1114	0.10/0.16	1.00/1.30	0.045	0.08/0.13	1114
C-1115	**0.13/0.18**	**0.60/0.90**	**0.045**	**0.08/0.13**	**1115**
C-1116	0.14/0.20	1.10/1.40	0.045	0.16/0.23	1116
C-1117	0.14/0.20	1.00/1.30	0.045	0.08/0.13	1117
C-1118	**0.14/0.20**	**1.30/1.60**	**0.045**	**0.08/0.13**	**1118**
C-1119	0.14/0.20	1.00/1.30	0.045	0.24/0.33	1119
C-1120	**0.18/0.23**	**0.70/1.00**	**0.045**	**0.08/0.13**	**1120**
C-1125	0.22/0.28	0.60/0.90	0.045	0.08/0.13	—
C-1126	0.23/0.29	0.70/1.00	0.045	0.08/0.13	1126
C-1137	**0.32/0.39**	**1.35/1.65**	**0.045**	**0.08/0.13**	**1137**
C-1138	0.34/0.40	0.70/1.00	0.045	0.08/0.13	1138
C-1140	0.37/0.44	0.70/1.00	0.045	0.08/0.13	1140
C-1141	0.37/0.45	1.35/1.65	0.045	0.08/0.13	1141
C-1144	0.40/0.48	1.35/1.65	0.045	0.24/0.33	1144
C-1145	**0.42/0.49**	**0.70/1.00**	**0.045**	**0.04/0.07**	**1145**
C-1146	0.42/0.49	0.70/1.00	0.045	0.08/0.13	1146
C-1151	**0.48/0.55**	**0.70/1.00**	**0.045**	**0.08/0.13**	**1151**

TABLE III — ACID BESSEMER RESULPHURIZED STEELS

B-1111	0.13 Max.	0.60/0.90	0.07/0.12	0.08/0.15	1111
B-1112	0.13 Max.	0.70/1.00	0.07/0.12	0.16/0.23	1112
B-1113	0.13 Max.	0.70/1.00	0.07/0.12	0.24/0.33	1113

NON-STANDARD OR RESTRICTED STEELS

TABLE IV — BASIC AND ACID OPEN HEARTH AND ACID BESSEMER STEELS

(1) Elements	(2) When Maximum of Specified Range is	(3) Range	(4) Narrowest Restricted Range	(5) Lowest Non-Restricted Maximum	(6) Lowest Restricted Maximum
Carbon.	To 0.25 incl.	0.05	.....	.....	.....
See Note 1	Over 0.25 to 0.40 incl.	0.06	0.05	.....	.....
	Over 0.40 to 0.55 incl.	0.07	0.05	.....	.....
	Over 0.55 to 0.80 incl.	0.10	0.07	.....	.....
	Over 0.80 to 0.95 incl.	0.13	0.09	.....	.....
	Over 0.95 to 1.35 incl.	0.15	0.10	.....	.....
	Basic Open Hearth Steel	.....	.....	0.09	0.07
	Acid Bessemer Steel	.....	.....	0.08	0.07
Manganese	To 0.40 incl.	0.15	0.10	0.40	0.35
	Over 0.40 to 0.50 incl.	0.20	0.15	.....	.....
	Over 0.50 to 1.65 incl.	0.30	0.20	.....	.....
Phosphorus	To 0.08 incl.	0.03	.....	.....	.....
	Over 0.08 to 0.13 incl.	0.05	.....	.....	.....
	Basic Open Hearth Steel	.....	.....	0.04	0.025
	Acid Open Hearth Steel	.....	.....	0.05	0.035
	Acid Bessemer Steel	.....	.....	0.11	.....
Sulphur.	To 0.07 incl.	0.03	.....	.....	.....
See Note 2	Over 0.07 to 0.15 incl.	0.05	.....	.....	.....
	Over 0.15 to 0.23 incl.	0.07	.....	.....	.....
	Over 0.23 to 0.33 incl.	0.09	.....	.....	.....
	Basic Open Hearth Steel	.....	.....	0.05	0.035
	Acid Open Hearth Steel	.....	.....	0.05	0.045
	Acid Bessemer Steel	.....	.....	0.06	.....
Silicon. See Note 3	Silicon when required for nonstandard forging quality semifinished steels may be specified only to the following limitations: 0.10 max., 0.07/0.15, 0.10/0.20, 0.15/0.30 or 0.30/0.60.				
Copper.	When required, any minimum up to 0.20 incl. may be specified. Minima over 0.20 to 0.40 incl., specified only after negotiation.				

or minus, for individual pieces, or for lots less than a carload. For carload lots, the permissible variation is 2½%, plus or minus, of the total weight of the lot. Theoretical weight of steel is calculated on the basis of 0.2833 lb. per cu. in.

In regular practice, semifinished products are cut to length by hot shearing. Other acceptable methods such as hot sawing or flame cutting may be used, depending on the composition of the steel and the mill's facilities, and if specified or required are considered special practices.

When end distortion or burrs normally encountered in regular mill cutting practices are not satisfactory to the purchaser, special end preparation should be specified. Such conditioning may be done by chipping, grinding or other means, and is a special practice.

Cold shearing of carbon-steel billets without breaking may be performed in the sizes and composition limits shown below, only if precautions are taken in line with these suggestions. The size limits are based on shearing steel that has not been reheated after rolling. Larger sizes or higher carbon contents should be preannealed, hot sheared, or cut by other methods dependent upon the grade and section.

Maximum Thickness for Cold Shearing

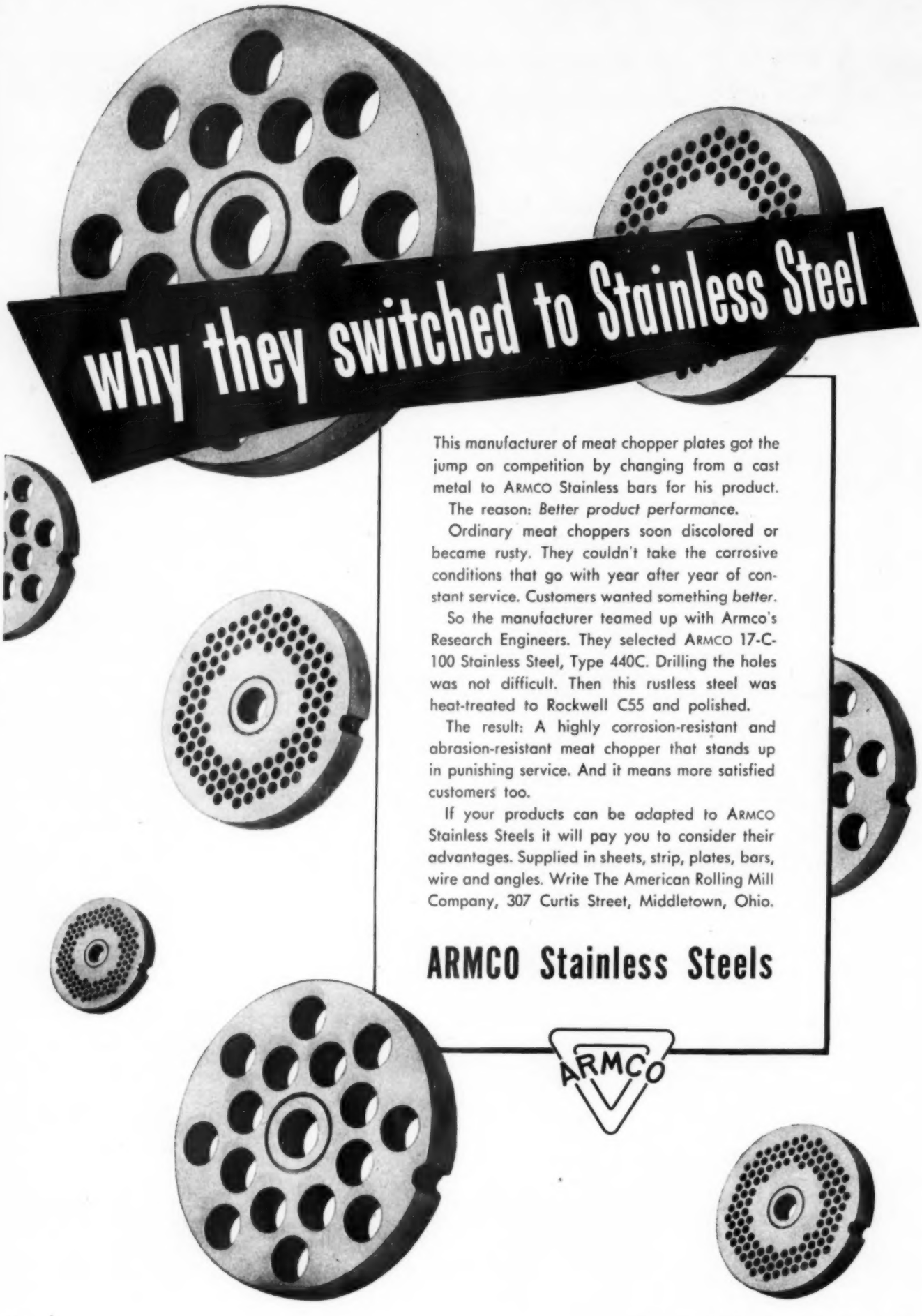
Manganese Max. of Range	When Max. of Carbon Range Is	Size of Billet
To 1.00%, Incl.	0.08 to 0.25%	4½
To 1.00%, Incl.	0.26 to 0.32%	4
Over 1.00% to 1.40%, Incl.	0.08% to 0.25%	4

The two principal classes of failure due to cold shearing are breaking transversely, and cracking or splitting longitudinally, after the cut is made.

Note 1. Carbon: The carbon ranges shown in column (3) apply when the specified maximum limit for manganese does not exceed 1.00 %. When the maximum manganese limit exceeds 1.00%, add 0.01 to the carbon ranges shown in columns (3) and (4).

Note 2. Sulphur ranges shown apply to basic open hearth and acid Bessemer steels.

Note 3. Silicon ranges shown apply to basic open hearth steel. Acid Bessemer steel is not furnished to specified silicon limits. Acid open hearth forging quality semifinished steel will be furnished with a 0.20-0.35 silicon. Special practice is necessary to meet a specified silicon range in a resulphurized steel.



why they switched to Stainless Steel

This manufacturer of meat chopper plates got the jump on competition by changing from a cast metal to ARMCO Stainless bars for his product.

The reason: *Better product performance.*

Ordinary meat choppers soon discolored or became rusty. They couldn't take the corrosive conditions that go with year after year of constant service. Customers wanted something *better.*

So the manufacturer teamed up with Armco's Research Engineers. They selected ARMCO 17-C-100 Stainless Steel, Type 440C. Drilling the holes was not difficult. Then this rustless steel was heat-treated to Rockwell C55 and polished.

The result: A highly corrosion-resistant and abrasion-resistant meat chopper that stands up in punishing service. And it means more satisfied customers too.

If your products can be adapted to ARMCO Stainless Steels it will pay you to consider their advantages. Supplied in sheets, strip, plates, bars, wire and angles. Write The American Rolling Mill Company, 307 Curtis Street, Middletown, Ohio.

ARMCO Stainless Steels

ARMCO

American Machinist REFERENCE BOOK SHEET

Standard Limits and Fits

STANDARDIZATION of tolerances and allowances for dimensions of parts for cylindrical fits has been discussed for many years. An American Standard (ASA B4a—1925), prepared by Sectional Committee B4 of the American Society of Mechanical Engineers, was approved by the American Standards Association. Further work was done by an ASA War Committee. The present standard (ASA B4.1—1947) "Limits and Fits for Engineering and Manufacturing, Part I," was prepared from the ASA War Committee's work. Features of the new standard are:

1. The table of preferred sizes helps to reduce the different diameters commonly used in a given size range, and should help to simplify the sizes of bar stock used, along with bushings, reamers and gages.

2. Preferred tolerances logically complement preferred sizes, to provide economies in stock parts, tools and gages.

3. The unilateral tolerance system allows greatest flexibility in manufacture. Tolerance on each part is taken in one direction only from the design size.

4. Basic hole and basic shaft systems are included.

Part II of the Standard will be the result of a study of other factors—length of engagement, bearing load, surface finish, lubrication and materials—of major importance in engineering a fit for a particular problem.

Scope and Application

1. *Scope.* This standard gives definitions of terms applying to fits between plain (non-threaded) parts and makes recommendations concerning the procedure of specifying such fits, including the choice of the basic size of the parts and their tolerances; the allowance of the fit; the use of the basic hole system or the basic shaft system; and recommended fits for general engineering purposes.

2. *Application of Standard.* The recommendations made in this standard apply particularly to fits between cylindrical parts, briefly designated as "holes" and "shafts," in which case the term "size" refers to the diameter of the mating parts. The data may be applied also to fits between mating parts other than cylindrical, in which case the "size" refers to a length, width, or dimension instead of a diameter.

Definitions

3. *Dimension.* A dimension is a specified value of a diameter, length, angle, or other geometrical characteristic of a part.

4. *Nominal Size.* The nominal size is the size which is used for purposes of general identification.

Table 1—Preferred Basic Sizes

	0.0100	5/16	0.3125	1 7/16	1.8750
	0.0125	3/8	0.3750	2	2.0000
1/64	0.01562	7/16	0.4375	2 1/8	2.1250
	0.0200	1/2	0.5000	2 1/4	2.2500
	0.0250	9/16	0.5625	2 3/8	2.3750
1/32	0.03125	5/8	0.6250	2 1/2	2.5000
	0.0400	11/16	0.6875	2 5/8	2.6250
	0.0500	3/4	0.7500	2 3/4	2.7500
1/16	0.0625	7/8	0.8750	2 7/8	2.8750
	0.0800	1	1.0000	3	3.0000
3/32	0.09375	1 1/8	1.1250	3 1/4	3.2500
	0.1000	1 1/4	1.2500	3 1/2	3.5000
1/8	0.1250	1 3/8	1.3750	3 3/4	3.7500
5/32	0.15625	1 1/2	1.5000	4	4.0000
3/16	0.1875	1 5/8	1.6250		
1/4	0.2500	1 3/4	1.7500		

All dimensions are given in inches.

Table 2—Tolerances and Allowances*

0.0001	0.0006	0.0025	**0.0100**
0.00015	0.0008	0.0030	0.0120
0.0002	**0.0010**	0.0040	0.0150
0.00025	0.0012	**0.0050**	**0.0200**
0.0003	0.0015	0.0060	0.0250
0.0004	**0.0020**	0.0080	**0.0300**
0.0005			

All dimensions are given in inches.

**The values indicated in heavy type are the preferred values.*

5. *Basic Size.* The basic size of a dimension is the theoretical size from which the limits for that dimension are derived by the application of the allowance and tolerance.

6. *Design Size.* The design size of a dimension is the size in relation to which the limits of tolerance for that dimension are assigned.

7. *Actual Size.* The actual size of a dimension is the measured size of that dimension on an individual part.

8. *Limits of Size.* These limits are the maximum and minimum sizes permissible for a specific dimension.

9. *Tolerance.* The tolerance on a dimension is the total permissible variation in its size. The tolerance is the difference between the limits of size.

10. *Unilateral Tolerance System.* The unilateral tolerance system is a system in which the tolerance is given in one direction only; plus for the hole and minus for the shaft. This is the basis for this standard.

11. *Fit.* The fit between two mating parts is the relationship existing between them with respect to the amount of clearance or interference which is present when they are assembled.

12. *Allowance.* Allowance is a prescribed difference in dimensions of mating parts. It is a minimum clearance (positive allowance) or maximum interference (negative allowance) between mating parts.

13. *Clearance Fit.* A fit between mating parts having limits of size so prescribed that a clearance always results in assembly.

14. *Interference Fit.* A fit between mating parts having limits of size so prescribed that an interference always results in assembly.

15. *Transition Fit.* A fit between mating parts having limits of size so prescribed as to partially or wholly overlap, so that either a clearance or interference may result in assembly.

16. *Basic Hole System.* The basic hole system of fits is a system in which the minimum limit of each hole size is basic. The fit desired is obtained by varying the allowance of the shaft and the tolerances of the mating parts.

17. *Basic Shaft System.* The basic shaft system of fits is a system in which the maximum limit of each shaft size is basic. The fit desired is obtained by varying the allowance of the hole and the tolerances of the mating parts.

Preferred Basic Sizes

18. *Basic Sizes 4 In. and Below.* It is recommended that in specifying fits, the basic sizes of the mating parts be chosen from Table 1.

19. *Diameters Above 4 In.* Diameters larger than 4 in. are usually adopted on the basis of engineering considerations. Therefore, no preferred sizes in this larger range are given in Table 1.

Acceptance of Parts

20. *Acceptability.* A part shall be acceptable if its actual size does not exceed the limits of size specified in numerical values on the drawing or in writing. It does not meet dimensional specification if its actual size exceeds those limits.

21. *Reference Temperature.* The actual size of a part shall be considered to be that size which the part has when it is measured at the International Standard Reference Temperature of 68 F. (20C).

Tolerances and Allowances

22. *Choice of Values.* It is recommended that in specifying fits, the tolerances and allowances be chosen from the values in Table 2, the values in heavy type being preferred.

Basic Hole and Basic Shaft Systems

23. *Choice Between Two Systems.* A cylindrical fit shall be specified in such a manner that it will be identified as belonging to either the basic hole system or the basic shaft system. The decision whether a fit shall be specified in the basic hole system or basic shaft system must be made after due consideration of a number of factors concerning the design of the product to which the part belongs and the methods by which the part is to be manufactured.

Announcing

A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring **1.** An endless variety of contours or combinations may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii.

2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece—uninfluenced by temperature changes.

Model 36

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed. Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks. When moving between intermittent or successive cuts, tool goes into rapid traverse.

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool. Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.

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You may see this machine in operation in our Booth No. 311 at the Show. We will also have a complete line of six spindle automatic screw machines, four, six and eight spindle chucking machines, a double end chucker, and a new revolutionary turret lathe. We'll be seeing you September 17.

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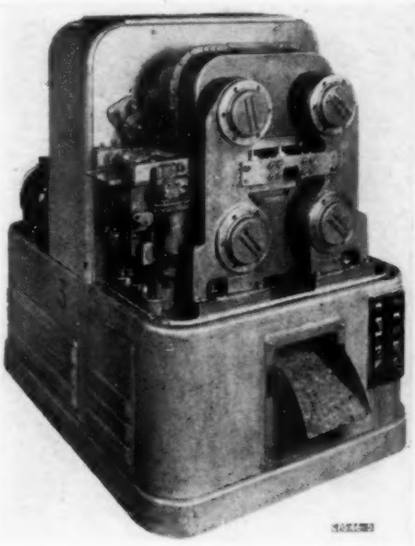
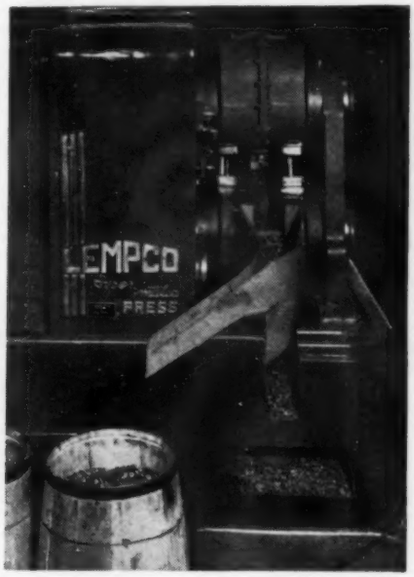
Shop Equipment News



Nuts for machine screws are punched out in this Hypermatic at a rate of 1150 per min. Ends of the four crankshafts can be seen in this view



"Butterfly" type lock washers are produced at a rate of 1700 per min. in this model. Covers have been removed to show press construction

Lempco "Hypermatic" Punch Press Gives up to 1800 Strokes per Min.

A punch press which provides extremely high speeds and uses rotary motion to actuate the dies has been announced by Lempco Products, Inc., Bedford, Ohio. Up to 1800 strokes per min. can be obtained on the unit, with stock accurately registered. It is known as the "Hypermatic" and is made in 10- and 50-ton models.

While action of conventional presses is reciprocal, this unit uses four crankshafts, the upper two rotating clockwise to drive the upper diehead and the lower two rotating counter-clockwise to drive the lower diehead.

The die members, mounted in Lempco anti-friction diesets, are mounted between the two dieheads. The punch holder is fastened to the upper head, and the die-holder to the lower head. Therefore the punches and dies have the same rotary motions as their respective dieheads, closing and opening with each cycle of the crankshafts. They are designed to cut stock while it is actually in horizontal motion through the press.

The stock feeds from right to left through friction feed rolls. It moves to and through a stripper plate which shuttles back and forth horizontally with no vertical movement. Both the punch and die approach and recede from the stock, leaving it free to move without interference.

Built without conventional flywheels, the press avoids shock loading of the press parts. The force required to make each cut is merely subtracted from the circular inertia of the heads, and no perceptible shock load is said to be received by the cranks. Any force developed in the "Hypermatic" is opposed by a similar force said to absorb it and completely eliminate vibration. Thus the machine requires no floor bolts. Counterbalances on each head compensate for any change in stroke length.

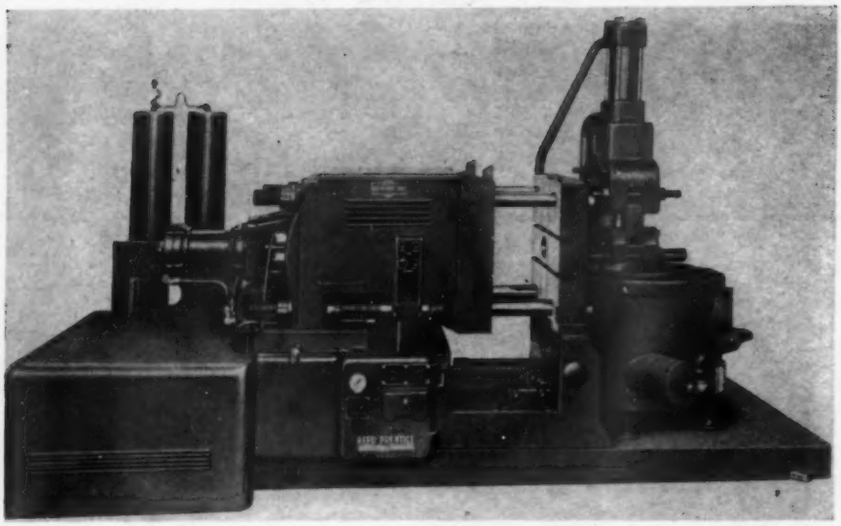
The high velocity of the press results in about 10% cut and 90% break. This feature is said to result in clean stampings with little burr, distortion and draft. It is comparable to a high-velocity bullet traveling through a piece of glass, leaving a hole as if it had been drilled. Thus the high speed gives the press properties to enable it to stamp out a fraction of a part on the last "hit" without damage to punch or punch edge.

The roller-type feed mechanism is synchronized with press speed and pitch of part being produced. Maximum stock feed is approximately 5600 lineal inches per min. on the 10-ton model, and 10,000 lineal inches per min. on the 50-ton model. When pilot pins are used for extreme accuracy, the rolls may be "cracked" at any point in the cycle so that stock may be carried through either entirely or in part by the die members themselves.

Feed-roll mechanisms are set on both sides of the press. Either or both may be engaged, disengaged or removed according to job requirements. Drive of the feeding mechanism is positive by means of a gear train. There are over 5000 roll speeds possible, and they are changed on pick-off gears similar to those on lathes. Either coiled or straight-cut strip stock can be used in the machine.

Two electric driving motors are incorporated: one each for upper and lower dieheads. They drive through a geared transmission enclosed in the main housing and operating in an oil spray. A separate motor provides pressure lubrication to crankshaft and diehead bearings and the oil spray to the transmission box.

All moving parts of the "Hypermatic" are totally enclosed, and at no time is it necessary for the operator to reach in between moving parts while the press is in motion.



Nitrogen-loaded accumulators are used for fast plunger speeds on this unit

Reed-Prentice No. 2 Die Caster Handles Lead, Tin, Zinc Alloys

The No. 2 die-casting machine has been added to the line of Reed-Prentice Corp., Worcester 4, Mass. Designed for casting lead, tin or zinc-base alloys, it has a large casting area. Die plates are 38x36 in. and space between bars is 24x24 in. Up to 16 lb. of zinc can be cast at 1400 psi.

Operation is either manual or semi-automatic. When semi-automatic, dies are closed manually by pushbuttons on the control panel, after which the rest of the cycle is automatic and controlled by an adjustable electric timing device.

The four pushbuttons on the control panel are used when the cycle is manual. The upper two are for opening and closing the dies. The other two actuate the plunger.

The unit is electrically interlocked to eliminate all danger of shooting the metal until dies are closed. Castings can be automatically ejected. The die plates are finished on the sides to provide for a core-pulling attachment, and a pushbutton-operated control valve is incorporated to actuate the core-pulling cylinders when used.

The die opens 10 or 14 in., and locking pressure is 400 ton. Plunger stroke is 8½ in., and the motor is 15 hp. The round-type furnace permits tangential firing and elimination of stress points caused by rectangular corners. Design permits easy removal of gooseneck and nozzle.

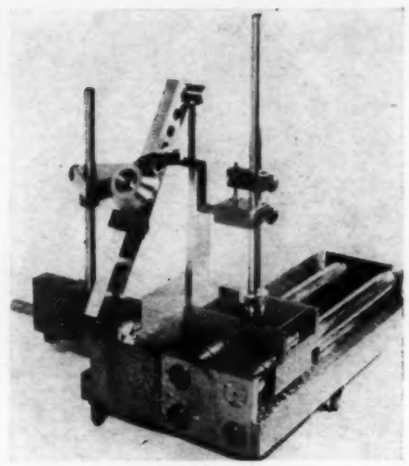
The No. 2 is available with horizontal plunger and cold-chamber attachment for die-casting magnesium, aluminum or brass alloys.

Northern Tool 20-Ton Press Is Self-Contained, Portable

Northern Tool and Machine Co., 1120 N. 31st Ave., Melrose Park, Ill., has announced a 20-ton gap-frame hydraulic press. The unit occupies 18x36-in. floor space, is self-contained and portable. It has all-steel welded construction.

Stroke of the press is 12 in., and there is an 8-in. throat. The platen is 12x17 in. A stroke selector permits the operator to adjust stroke length in a few seconds with the tightening of a thumbscrew. Other features are: tonnage control to 20 ton, pressure-holding valve and fast ram speed.

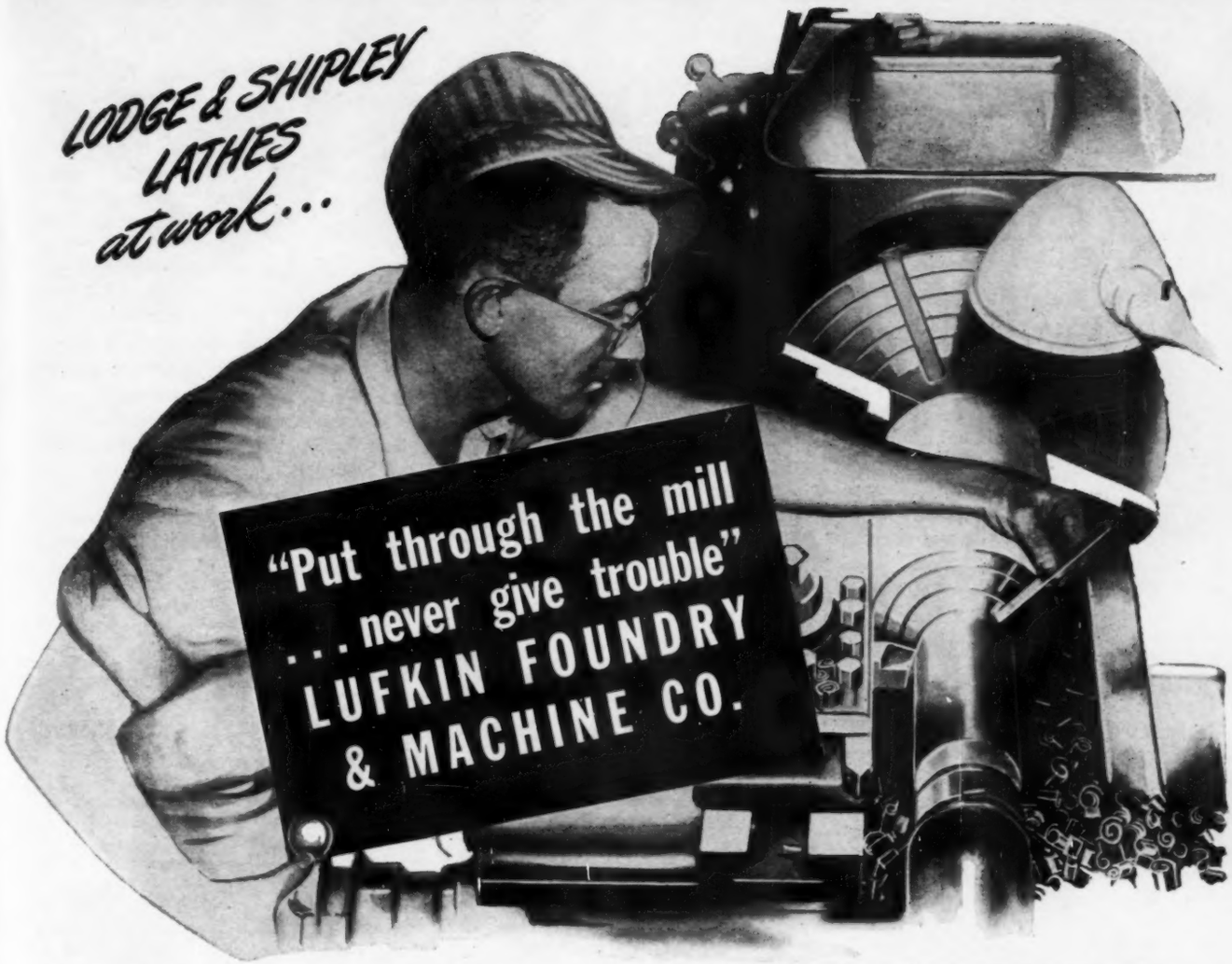
The press is motor driven and has a pressure gage at eye level. It can be adapted to operations such as drawing, bending, straightening, riveting and piercing. Control may be by hand or foot.



SINE-BAR FIXTURE checks precision angles and tapers. The sine bar is mounted on a base parallel to the indicator runway. After sine bar is set with gage blocks, it will not fall. Fixture can be carried to wherever job is being done. Made by The Patt Brothers Co., 70 Vine St., Willoughby, Ohio

Barnaby Floating-Holder Line Available in Four Diameters

A line of all-steel precision floating holders is made by Barnaby Mfg. and Tool Co., 70 Knowlton St., Bridgeport 8, Conn. Available shank diameters are ⅝, ¾, 1 and 1¼ in. A drill, reamer or similar tool to be aligned with the work is held in the head of the holder either directly or by means of a bushing. The tool is clamped by a hardened-steel setscrew. One hinged-shoe bushing blank is furnished with each holder.

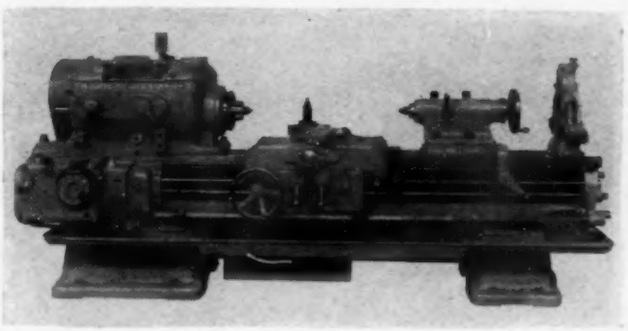


● Tough jobs are the every day task of Lodge & Shipley Lathes at Lufkin Foundry & Machine Co., Texas, noted producer of oil well pumping equipment. In such service, this firm reports that "output and accuracy are high; trouble non-existent."

And that's typical of the comments from satisfied Lodge & Shipley owners, reporting that their Lodge & Shipley Lathes and Turret Lathes outperform previous lathes in every way, pleasing both operators and management.

In the illustration above, a herringbone pinion gear is being machined on a new 20" Lodge & Shipley Lathe. As much as 1¼" of diameter is removed in a single cut . . . from a gear blank made of SAE 4140 steel, heat-treated to 290-320 Brinell.

The new series of 18 and 20 inch Lodge & Shipley Lathes are brand-new from pulley to tailstock . . .



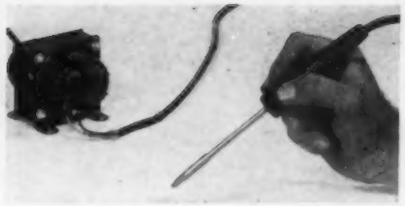
outstanding in every detail. Designed to permit the widest possible use . . . the greatest possible profit, these great new lathes can have many applications in your plant. Let a Lodge & Shipley Engineer show you case histories . . . prove their superiority. Write for Condensed Catalog showing our complete line of lathes.

THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN

SPECIAL PRODUCTS DIVISION • 800 EVANS ST.

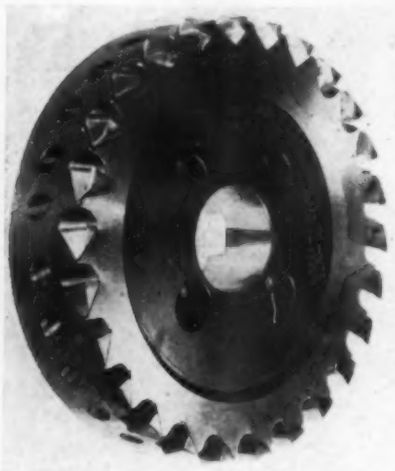


GE "Midget" Soldering Iron Works Where Space is Limited

The "Midget" lightweight Calrod soldering iron is announced by Industrial Heating Div., General Electric Co., Schenectady, N. Y. It is designed for precision soldering where space is limited and is available with ¼- and ⅛-in. dia. tips.

The unit is 8 in. long and weighs 1¾ oz. without cord. Rated at 25 w., it is used with an insulating transformer that will provide 6 v. A 4-tap transformer for variable heat is also available.

The Calrod heater, which forms the heat source, is built to within ½ in. of the working end to reduce heat loss and speed heat transfer. An Ironclad chisel-shaped copper tip is incorporated. Tip and heater can be replaced as a unit.

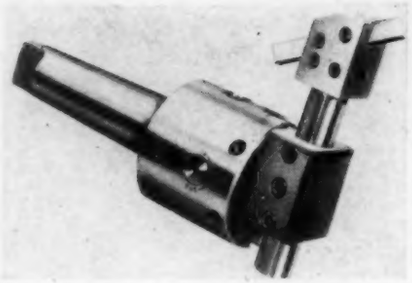


Weddell Tri-Bit Face Mills Have Closely Spaced Blades

Super Tri-Bit face mills have been developed by Weddell Tools, Inc., 37 Centennial St., Rochester 11, N. Y. They are designed for production work on frail malleable or alloyed castings such as cylinder blocks, motor frames and pump casings. Teeth are closely spaced so that feed rate can be fast. The spacing permits three blades to cut where only two do in conventional cutters. The triangular section of the cutter blades is said to have the same strength as 50% heavier rectangular blades.

To suit operating conditions, the blades adjust mostly in a radial direction in roughing cutters and mostly in an axial direction in finishing cutters. Adjustment is by a simple screw backing up each blade. The blades themselves are locked home in a vee by a single lockscrew and require no hammers, drifts or wedges. There are no fixed amounts of blade movement.

The mills are furnished with blades of any cutting material. Roughing cutters are generally heavy-duty type with ⅞-in. Tri-Bit, while finishers use a medium-duty ⅝-in. Tri-Bit. The same corresponding blade can be employed with either right- or left-hand cutters.



BORING BARS — Heavy-duty accessories used in Behr bars for facing, boring, fly-tooling and other operations announced by Behr Products Co., Detroit 3, Mich. Large hole adapter with split sleeve and extra-large hole adapter supplement present line. New range is: Bar A1500, to 9-in. dia.; Bar A1501, to 18-in. dia., and with extra-large adapter, up to 23-in. dia.

Line of Two Small Natco Machines Does Multiple Drilling, Tapping

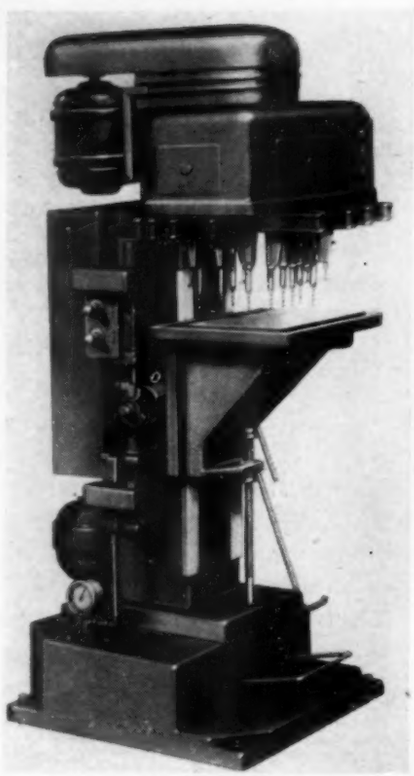
A line of two, small multi-drilling and -tapping machines has been developed by National Automatic Tool Co., Inc., Richmond, Ind. The two units, Model A-33A and Model A-33B, are said to provide high speed with high sensitivity.

The head on each model is bored for ten spindles. Spindle arrangement can be changed and reset to each particular application. A 9x12-in. worktable is incorporated. Spindle speeds from 650 to 3550 rpm. are changed by rearranging pulleys on the sheave on the top of the machine, giving ten speed variations. All electrical equipment is enclosed, and overload protection is provided on the machines.

Model A-33A provides hand and foot feed or combination hand, foot, and air-oil feed. It is equipped for both drilling and tapping, with close control for sensitive operation. Feed travel of the table on the hand and foot machine is 2½ in., while on the combination machine the travel is 4 in.

Model A-33B is designed for light precision tapping. It has a treadle-controlled air-feed table. A hand crank provides vertical table adjustment, and feed travel of the table is 2½ in.

All units are powered by 1-hp. motor. They are available with coolant system, cluster plate, slip spindle and other equipment as required. When drilling in cast iron or mild steel, the capacity of the A-33A machines is ⅛ in. (using ten spindles). All machines have a capacity for tapping in cast iron of 8-32 and 10-32 (using ten spindles).



The head of this A-33A machine is bored for ten spindles

EASIEST *OF ALL SHEARS* TO OPERATE

"EASIEST of all Shears to operate" are not just our words. They are words of operators being heard with increasing frequency as more Steelweld Shears are placed in plants throughout the country.

Men who have worked for many years on shears of various makes and know them through and through are acclaiming the many features incorporated into Steelwelds — features that ease their work, speed production and make for greater accuracy and minimum maintenance.

Steelweld Shears are entirely new machines designed from scratch as such. They are not a variation of or an adaptation to any previously existing machine. The designers of these new shears were free to incorporate all ideas and features that would result in better machines. They were not hampered by tradition or previous designs or models.

As a result Steelweld Shears are radically different with advantages never before possible.

Whether or not you are in need of a shear at this time, if you work plate in any thickness up to 1¼-inch or length to 18 feet, we urge you to get more data on these modern machines. Keep informed — send for the catalog below.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1405 East 282nd St. WICKLIFFE, OHIO.

STEELWELD PIVOTED BLADE SHEARS

Toccotron Induction Heater For Silver Brazing, Soldering

A 750-w., 450,000-cycle Toccotron has been added to the line of The Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio. A bench-type induction-heating machine, it is designed for silver brazing and soldering. It can also be adapted to annealing, hardening and forging applications within its capacity.

A tube-oscillator type, the unit operates on 110/220 v. ac. No water connections are needed, and either single- or multiple-turn inductor coils can be accomodated. The coils can be made by forming copper tubing or wire to required shape. The unit is designed for both automatic or manual operation. It can operate at full load for mass-production work, but also is adaptable to quick-change setups.

Twecotong Electrode Holder Weighs 18 oz., Is 9 in. Long

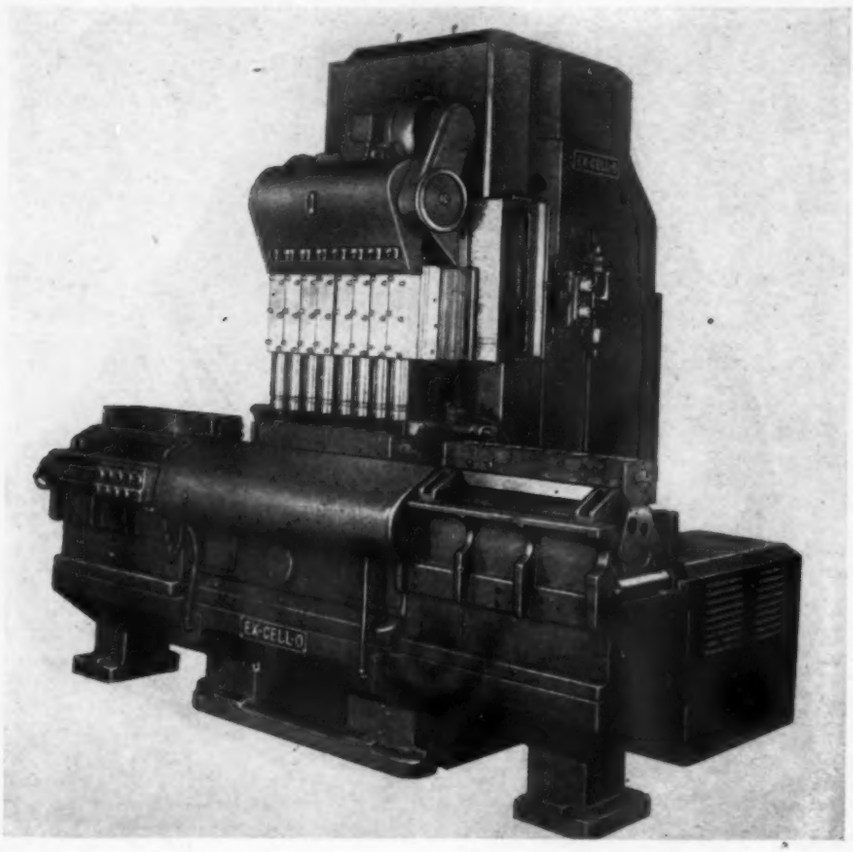
Tweco Products Co., Wichita 1, Kan., has announced the Model A-316 Twecotong electrode holder. A smaller unit than the A-14 and A-38 holders, it has 250-amp. capacity and holds 1/16- to 3/16-in. electrodes. Weight is 18 oz., and length is 9 in.

Tip and body insulation is molded laminated glass-cloth Bakelite using "Tubular-Keyed" Tweco design. The cable connection is a simple clamp. The unit is said to provide a 95-lb. bite on 3/16-in. electrode.

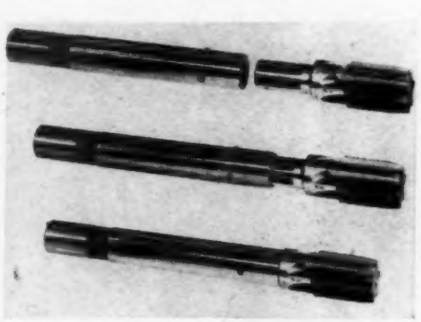
Improved Airco 190 Electrode Welds without Preheating Work

The improved Airco 190 electrode is available from Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. It was originally developed for use by the aircraft industry on assemblies to be heat-treated after welding. One improvement is that the necessity for preheating has been minimized when welding high-strength chrome-moly aircraft steels. Also, when preheating is not employed, the electrode is now less conducive to cracking adjacent to the weld area and between layers of the weld metal.

Ductile welds up to approximately 150,000-psi. tensile strength are said to be produced. The electrode operates on straight-polarity dc. or on ac. It is available in diameters of 3/32, ⅛, 5/32 and 3/16 in.



VERTICAL MACHINE precision bores automotive cylinders. Handles in-line or straight-type motor blocks. The blocks move from conveyor line to suitable fixture on boring machine where they are positioned, clamped and bored. Then blocks are unclamped and are in position to continue on conveyor. Known as Standard Style 66 Vertical Precision boring machine, it is made by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.



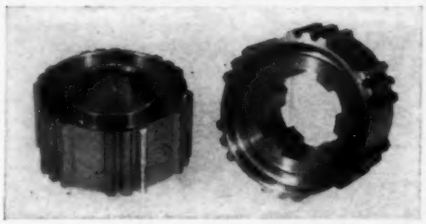
Taps Coupled to Hollow Shanks Made by Detroit Tap and Tool

Nib-type M-11 taps coupled to hollow shanks are available from Detroit Tap and Tool Co., 8432 Butler, Detroit 11, Mich. They are useful in applications, such as tapping pipe couplings, where fairly long tap shanks are used. Several parts are tapped at a time, and tapped parts load up on the shank. When full, the tap is removed from the quick-change type chuck to unload the parts. With solid-type shanks, this requires considerable effort, but with the 30%-lighter hollow shank the effort is reduced. The knurled portion of the shank assists the operator with oily hands when he removes the tap from the chuck.

GEAR HIGHLIGHTS

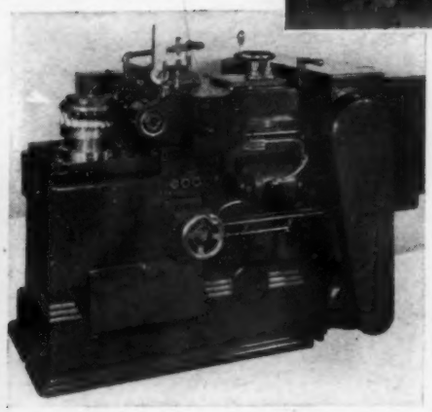
VOL. XI NO. 4

Conveyorized lime spreader operated through standard reducer *(See NEW WESTON CONE-DRIVE LIME SPREADER, p. 2 of GEAR HIGHLIGHTS).*

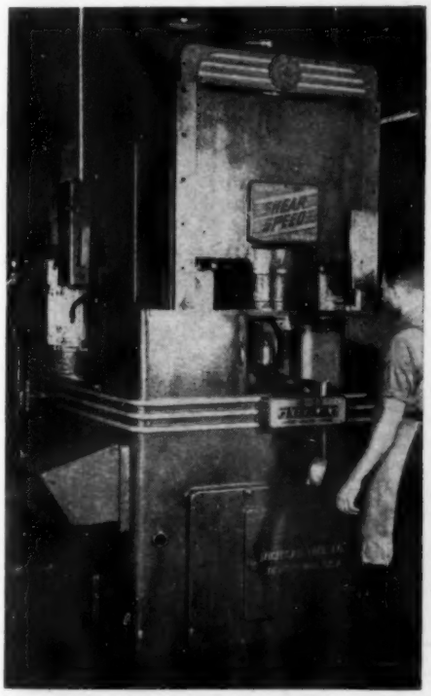


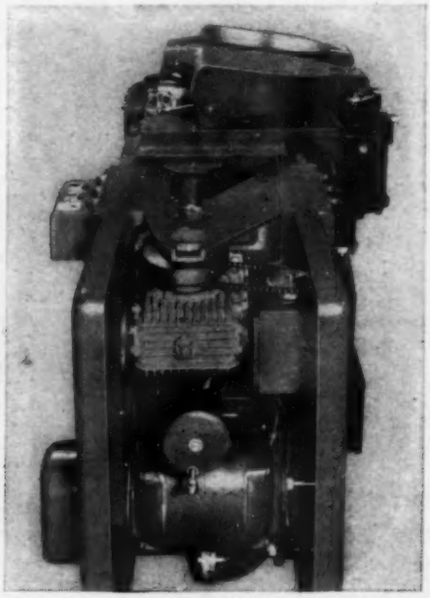
Precision cutting eliminates need for lapping Cone-Drives. *(See PRODUCING CONE-DRIVES on page 3 of GEAR HIGHLIGHTS).*

A single machine finish cuts transmission shifter clutch hubs at Ford at two every 55 seconds. *(See "SHEAR-SPEED," page 2 of GEAR HIGHLIGHTS).*



Below: "New" gears save space, increase acceleration and deceleration rate without high inertia loads. *(See FLASH-WELDER PROBLEMS SOLVED, page 2 of GEAR HIGHLIGHTS).*





We will be glad to send you the current issue of GEAR HIGHLIGHTS VOL. XI, NO. 4 giving the complete story on the above developments.

MICHIGAN TOOL COMPANY 7171 East McNichols Road DETROIT 12, - - U.S.A.

Red-E Ball-Bearing Centers Have Labyrinth Enclosures

The Ready Tool Co., 555 Iranistan Ave., Bridgeport 5, Conn., has announced Red-E standard ball-bearing centers designed for use with high-speed steel cutting tools. They are available in shank-, ball- and roller-bearing types.

New Departure double-row angular-contact ball bearings are said to provide thrust capacity one and one-half times radial capacity. A labyrinth enclosure is designed to prevent escape of lubricant or entry of cutting oil or chips. Accuracy is said to be held within 0.0002 in., with the point held to zero.

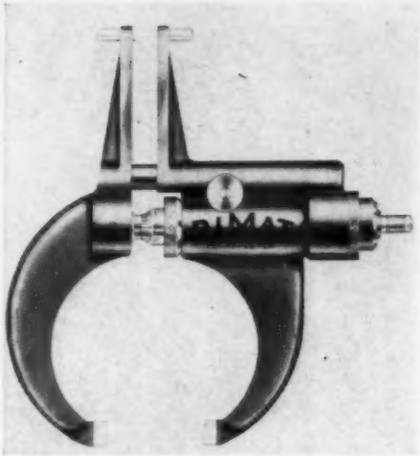
ELECTRIC MARKING TOOL vibrates 7000 strokes per min., has knurled adjusting collar to vary intensity. Cuts initials, designs and names on metal, glass, wood or plastic. Made in two models: one with special hard-alloy point, the other with diamond point. Unit weight 13 oz., operates on ac., is made by New Britain Machine Co., New Britain, Conn.

Airco No. 23A Welding Rod Welds Copper, Matches Color

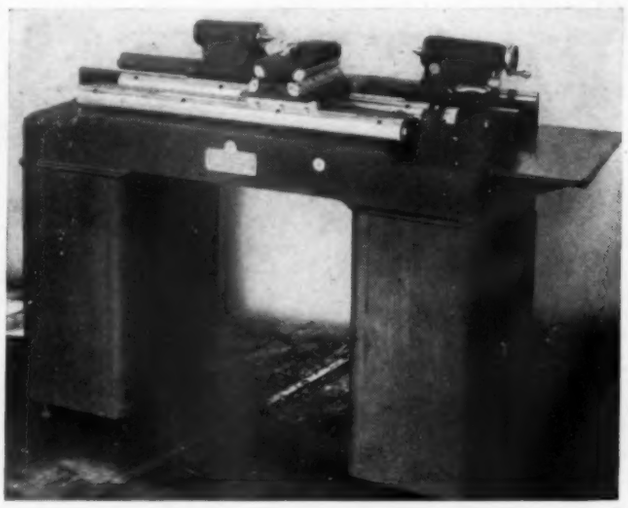
The Airco No. 23A silicon-copper welding rod is available from Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. The previous rod offered for copper welding was of a phosphorus-deoxidized copper analysis. The new rod is said to have superior flowing characteristics, provide stronger welds, and provide an excellent color match on copper. Made in ¼-, 3/16- and ⅛-in. dia., it is said to be the equal of silver-copper rods for this class of work.

Dilley "Goldigger" Device Salvages Precious Metals

The Dilley Mfg. Co., 1691 Ansel Rd., Cleveland 6, Ohio, has developed the Goldigger, a device to collect and salvage precious materials at point of operation. It fits over rotating machine spindles. Top section of the unit is made of "tru-vision" plexiglas. It is fitted to a shatter-resistant blue acrylic tray. The unit comes equipped with alnico permanent magnet ready for installation and adjustment to various operating conditions. It can be cleaned with soap and water.



DUPLEX MICROMETER takes internal and external measurements. Made by Richards Machine Tool Co., 124 S. Isabel St., Glendale 5, Calif. The "Rimat" unit is made in three sizes: 0 to 1, 1 to 2 and 2 to 3 in. Special sizes available to order. Ends of pins ground on radius for accuracy. Wearing surfaces are hardened and ground, can be adjusted if necessary



Automatic safety stop eliminates danger of carriage striking the measuring head spindle anvil and damaging the precision measuring screw

Pratt & Whitney Lead Tester Checks Lead Errors of Threads

The Model C Electro-Mechanical lead tester which checks lead errors of commercial threads is announced by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. Work up to 10-in. dia. and to 30 in. long can be held between tailstock centers. Longer work with ½- to 3-in. dia. can be held by V-block support. 26 in. of threads can be checked on one setup. Taper and straight threads are checked in the same manner.

The measuring head is a standard Supermicrometer headstock with 1-in. spindle travel. It is mounted on a special base. The dial has 50 graduations of 0.001 in., and a vernier reads to 0.0001-in. The spindle subdivides any given inch along the work. Even inch increments are obtained by the use of precision end measures. The thread-locating head is a standard Electrolimit universal-circuit head with ball point. It is carried by the cross-slide.

The thread-locating head operates the meter located on the measuring head. The ball point is centered in the vee of the thread by turning the dividing screw on the measuring head. When the meter indicates zero, the desired measuring point is reached. The lead is then read directly on the measuring head.

BORED CONTOURS AIR-TRACED

for greater accuracy

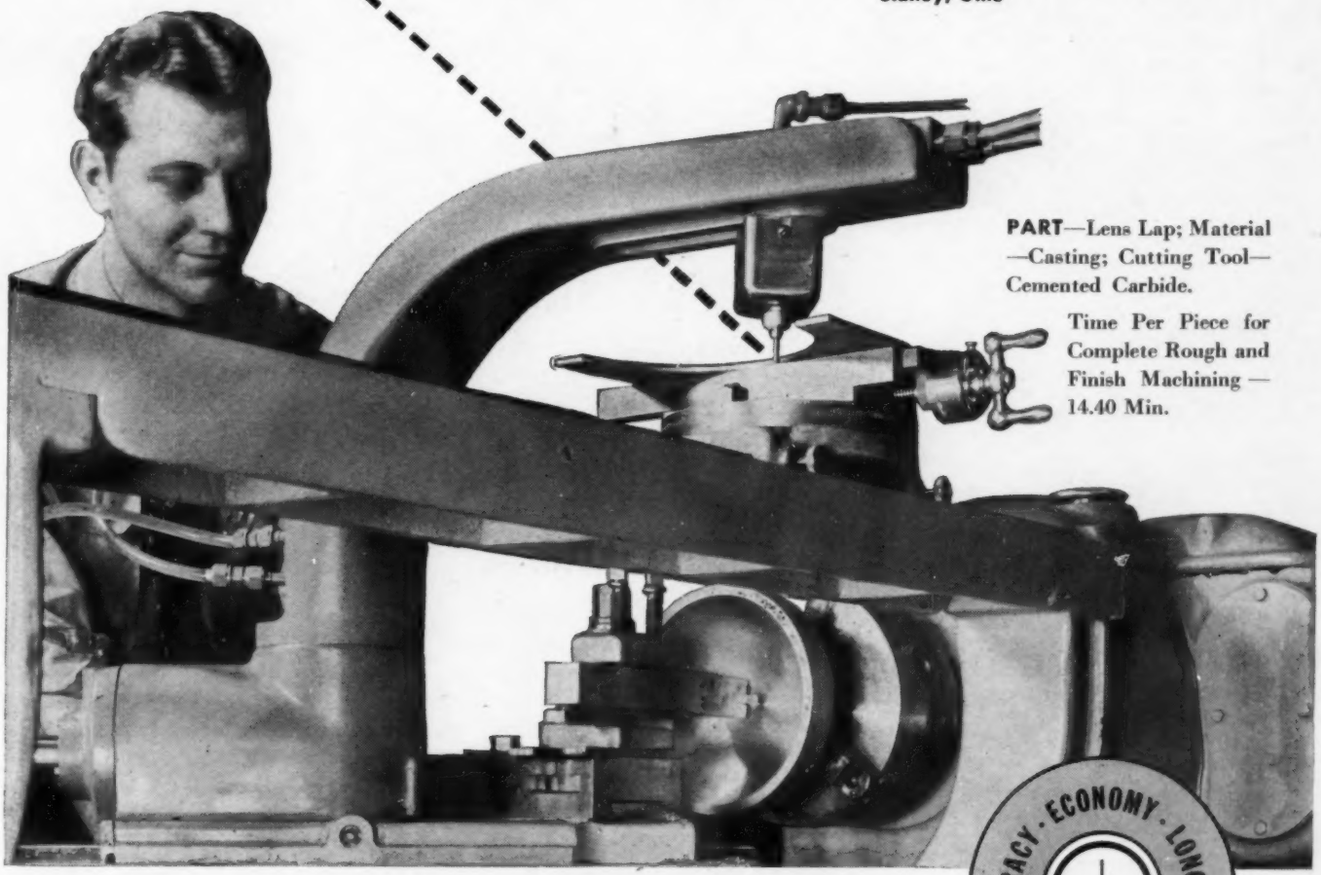
Molds, dies and similar contour boring jobs are a "natural" for the Monarch Air-Tracer.

With this new lathe attachment you can handle such work faster, for lower cost—and *more accurately*—because the cutting tool motion is stepless. Finish is better, tolerances are closer; the slightest change in template shape is instantly translated into slide feed.

On jobs where accuracy is all-important, this ability to follow contours closely pays off in dollars saved—by increased production, by closer tolerances, by fewer rejects. That's why the Air-Tracer was selected for the lens lap job illustrated; the final lens can be no more accurate than the machine that makes the lap. And the machine's accuracy isn't subject to human errors, either—the Air-Tracer's operation is continuous and automatic.

Whether you're boring or turning contours; machining tapers, step shafts or ordinary production lathe jobs, the Monarch Air-Tracer can save you time and money. Like more details? Ask for bulletin 2601.

THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio



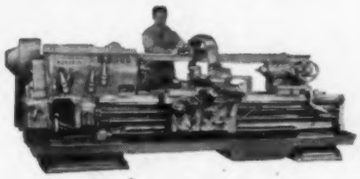
PART—Lens Lap; Material—Casting; Cutting Tool—Cemented Carbide.

Time Per Piece for Complete Rough and Finish Machining—14.40 Min.

FOR SPEED, ACCURACY AND FINISH, THE MONARCH AIR-TRACER*

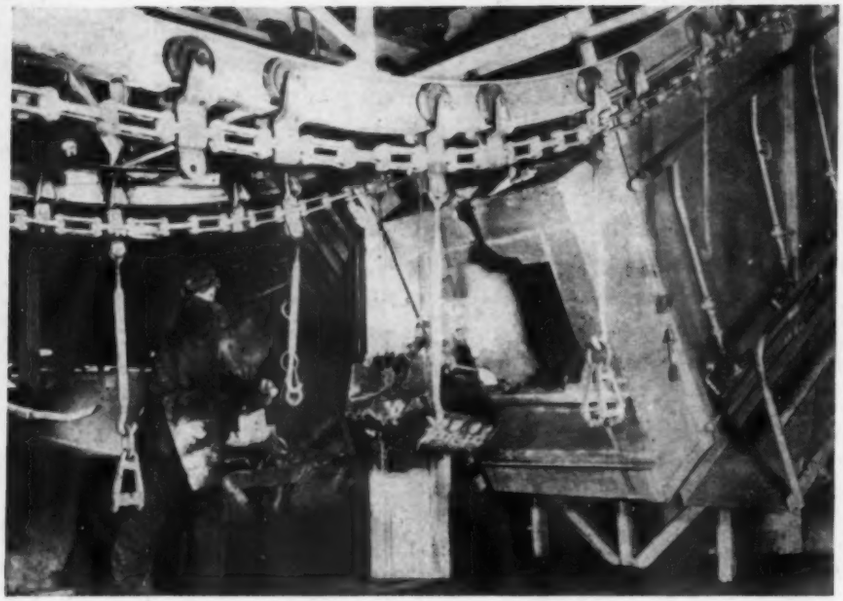
1. Stepless cutting-tool motion provides a superior continuous finish.
2. Setup times averaging five to ten minutes permit profitable use for a wide variety of small-lot production jobs.
3. Automatic yet versatile operation results in economical, accurate high production.

**Available exclusively on the new Monarch Lathes.*



ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES



CONTINUOUS FURNACE for relieving stresses in V-type automobile cylinder-block castings has 40 pressure-type gas burners, is 70 ft. long. Walls are 9-in. thick, have 4½ in. of 2300 F. insulating refractory and 4½ in. of brick. There are two heat zones automatically controlled by Brown electric potentiometer. Overhead conveyor provides capacity for loading one casting each 45 sec. (loading end illustrated). Made by Bellevue Industrial Furnace Co., Detroit 7

Denison Dial-Feed Accessory Attaches to Multipress Unit

A dial-feed accessory to feed small parts to the pressing station of the Multipress is announced by Denison Engineering Co., 1160 Dublin Rd., Columbus 16, Ohio. The dial is actuated with each retracting stroke of the ram by mechanical linkage connected with the banjo-type arm on the ram.

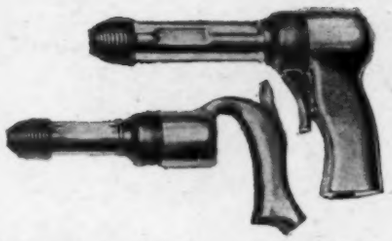
Simple adjustment of the actuator changes ram stroke to provide indexing 8, 12 or 24 times per dial revolution. The indexing stroke is regulated to position work beneath the ram by adjusting a hexnut on the left side of the table. Provision has been made for ejecting parts beneath the table by removing a section of the table casting. The ejection station is located 120° clockwise from the pressing station. Tooling is required at the pressing station only and can be easily installed and removed.

Line of 28 Pneumatic Tools Announced by Skilsaw, Inc.

A line of pneumatic tools in 28 models has been announced by Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill. These include pneumatic hammers, drills, screwdrivers, nut runners and grinders.

Drills, screwdrivers and nut runners are no longer than 7¼ in. nor heavier than 2¾ lb. Designed for balance and smooth operation, they are said to have long production life. They have six ball bearings and heat-treated gears and shafts. Optional speeds of 800, 1300 and 2100 rpm. are available for runners and drivers, which also have a ball-rolling adjustable clutch.

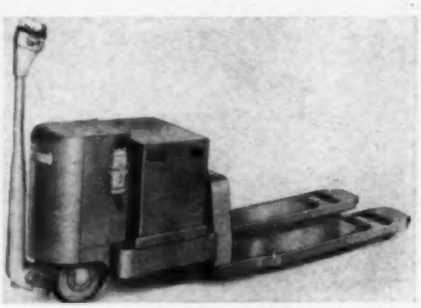
A range of speeds from 800 to 10,500 rpm. is available for the drills



A tapered clearance in the throttle-valve seat provides air metering for controlled blows on the hammers

Pneumatic grinders are available in three models. They are designed for operations such as die grinding, burring, rotary filing and use with wire-size drills. Free speed is 25,000 rpm. All models are 7 in. long, have 1½-in. dia. and weigh slightly over 1 lb. Design of rotor and bearings is said to virtually eliminate vibration.

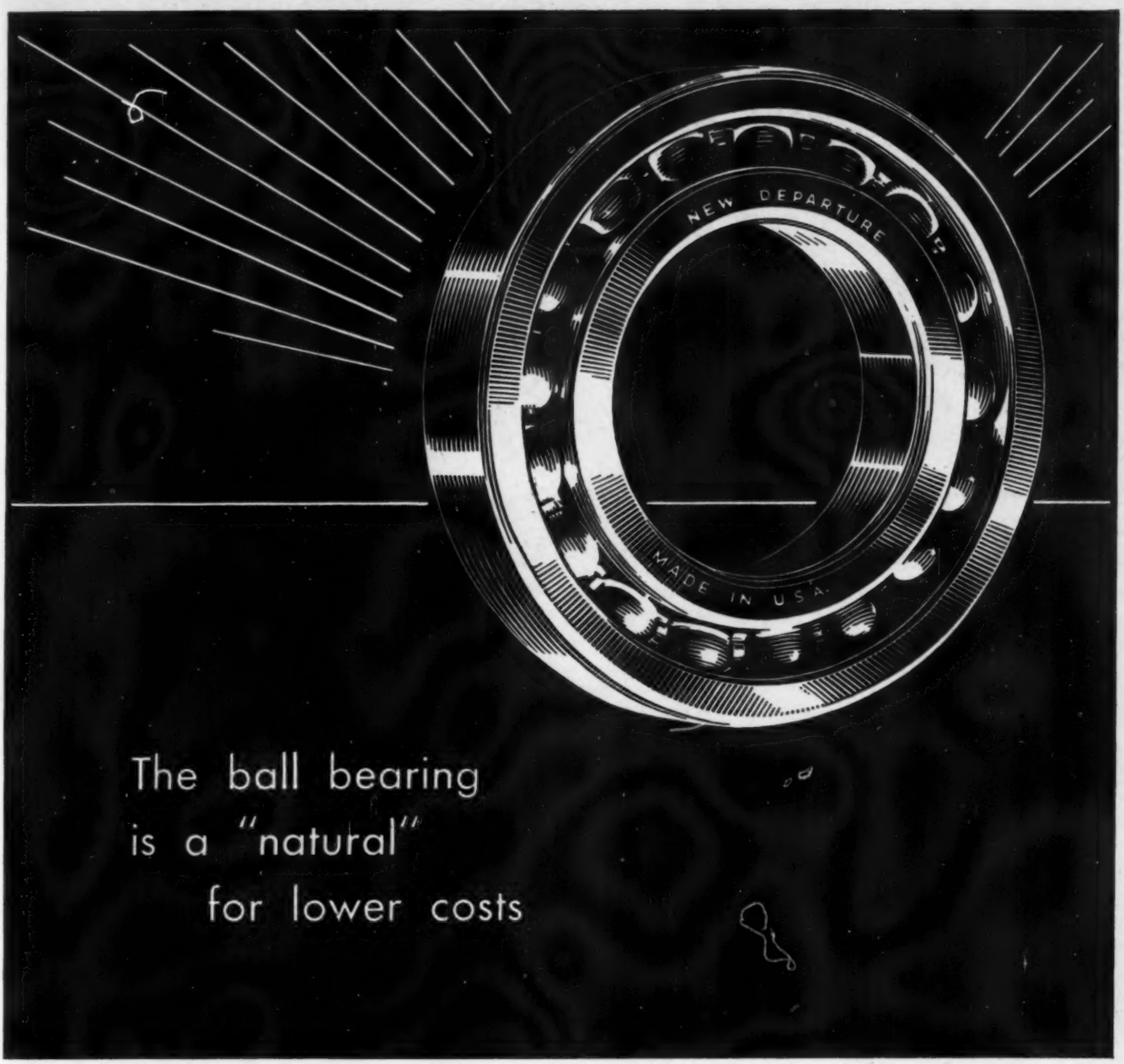
The hammers are made in three sizes, with four models in each size. They can perform jobs such as riveting, light chipping, caulking, gouging and star drilling. Offset or grip handles, Parker taper or hexagon nozzles are available.



Model K Motorized Lift Truck In Pallet and Platform Styles

The Model K Hydroelectric motorized lift truck is offered by Lift Trucks, Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio. It is made in pallet and platform styles in a variety of sizes. All units have 4,000-lb. capacity and two forward and two reverse speeds.

All speeds and the brake are controlled by three pushbuttons in the steering handle—regardless of handle position. The unit incorporates the Steubing two-wheel front drive for stability and easy turning. The "Steubing Power Package" (motor, drive and controller) can be removed from the frame as a unit.



LOWER manufacturing costs are very definitely a function of New Departure ball bearings.

The ball bearing is a "natural" for the higher speeds, greater rigidity and improved quality of product so demanded by today's exacting production standards.

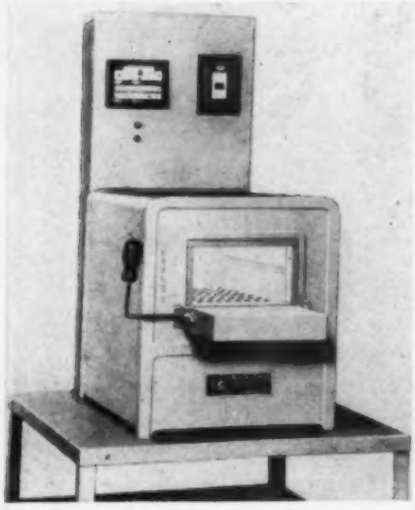
An investment in machines of modern ball bearing design is an investment in faster production — *lower costs!*

New Departure's technical literature is most helpful. Tell us your needs.

NEW DEPARTURE
BALL BEARINGS

3481

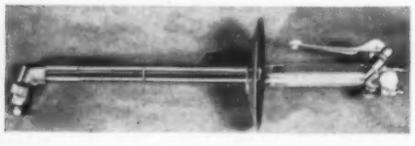
NEW DEPARTURE • Division of GENERAL MOTORS • Bristol, Conn. • DETROIT, CHICAGO, LOS ANGELES and other Principal Cities



Recirculating Air-Draw Furnace Made in Two Models by Cooley

Two furnaces of the recirculating air-draw type have been added to the line of small box-type units made by Cooley Electric Mfg. Corp., Indianapolis, Ind. One, Model ACL, can operate at temperatures to 900 F., and the other, Model ACH, can operate to 1200 F. Both handle 50 lb. of parts and are said to provide the accuracy and uniformity required in low-temperature heat-treating operations.

Temperature uniformity is said to be +5, −0 F. Temperature control is provided by a selective power modifier working with an indicating pyrometer. The modifier corrects temperature lag behind the pyrometer. Power input of the furnaces is 4 kw. at 230 v. A control panel and stand are available.

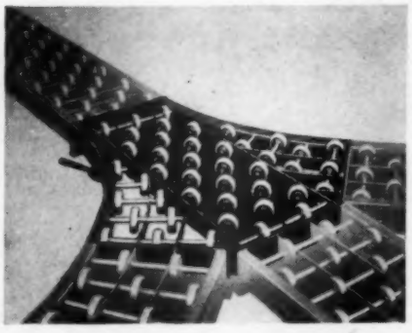


Oxweld Powder-Cutting Blowpipe Cuts Oxygen-Resistant Material

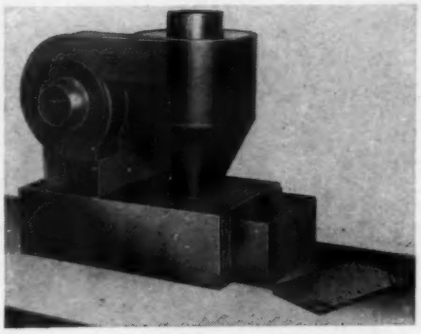
The Oxweld AC-4 powder-cutting blowpipe is announced by The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y. The unit is said to cut oxidation-resistant materials, such as stainless steels, with the same ease as carbon steels are cut with standard equipment.

In addition to oxygen and acetylene hoses, the unit has a third hose to conduct an iron-rich powder from a powder dispenser by means of compressed air. When the powder is burned, it increases the temperature and oxidizing effect of the oxygen-cutting action. Material to 9-in. thick can be cut.

For shape cutting the ACA-2 powder-cutting attachment is made for the Oxweld C-39 machine-cutting blowpipe. It is composed of powder valve, powder nozzle, and interconnecting tube for powder flow. It will cut stainless steels from ¼ to 3 in. thick at speeds from 20 to 7 ipm. respectively.



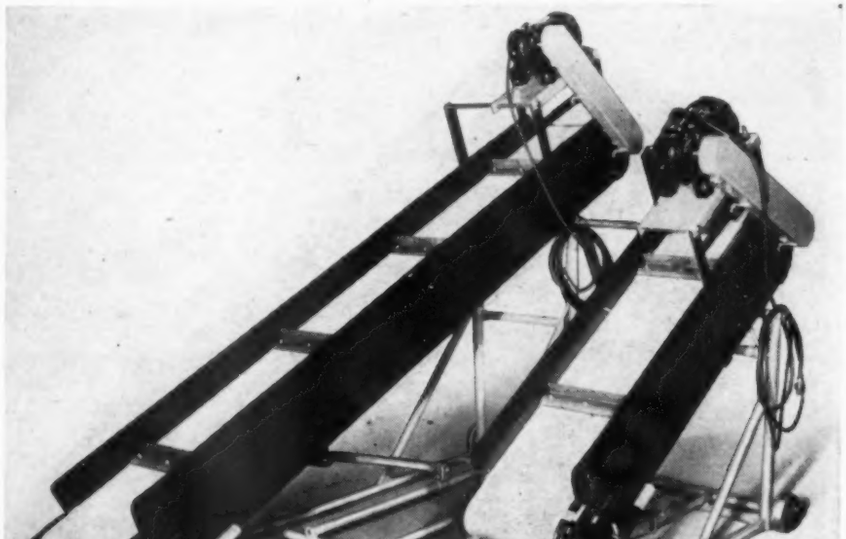
THREE-WAY SWITCH for roller conveyors made by E. W. Buschman Co., Inc., Cincinnati 32, Ohio. Pivot wheels in center portion of switch are controlled by single lever, are raised slightly above level of other wheels in "spin" portion to eliminate drag. Packages move in desired direction without manual guidance



Cleaned Air Carried Outside By Filterless Dustkop Unit

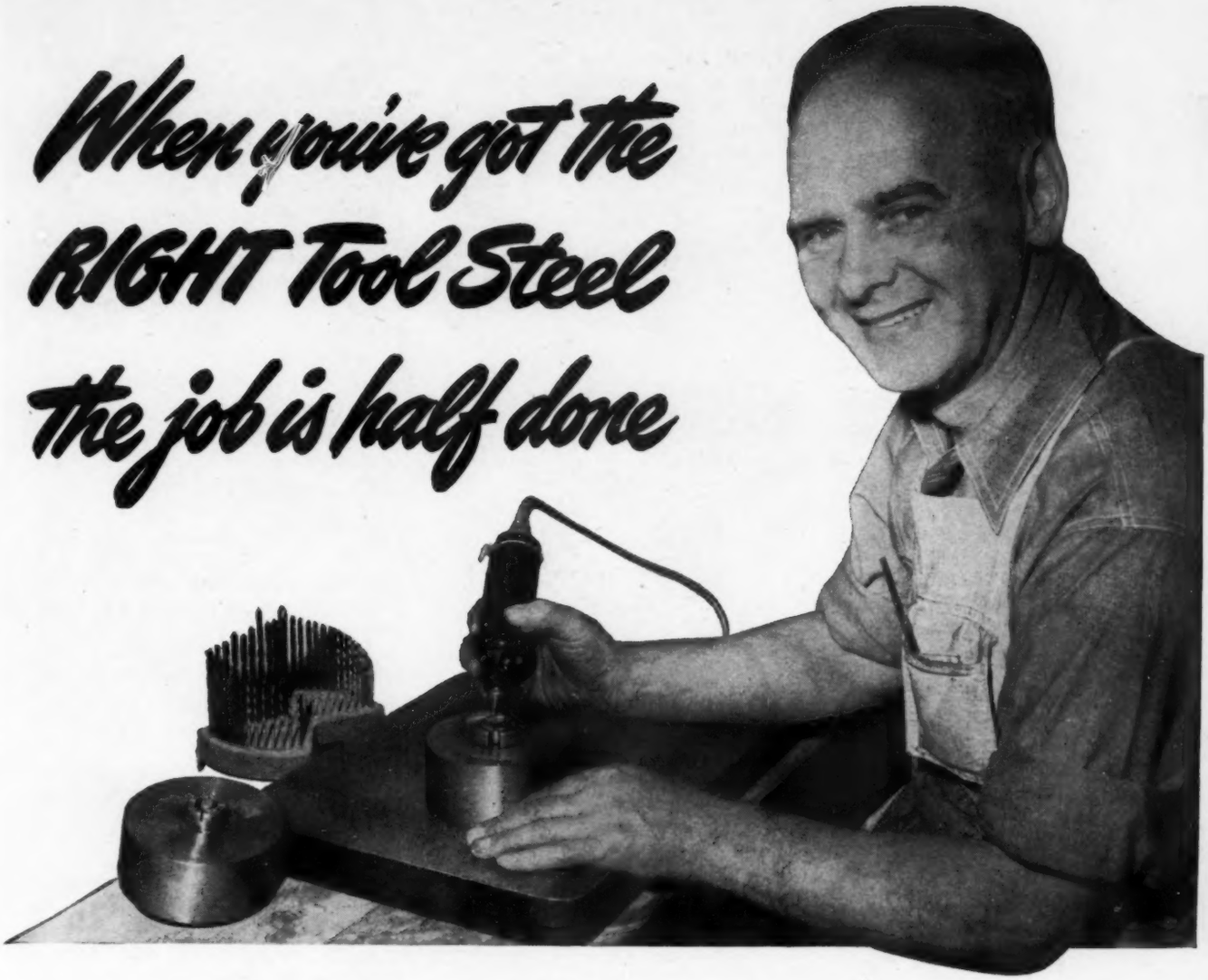
The Model 11N50 Dustkop has been announced by Aget-Detroit Co., Main & Washington Sts., Ann Arbor, Mich. It collects dust, lint and dirt from heavy-duty polishing, grinding and buffing work. Instead of the customary second-stage filter of spun glass with a hand shaker-crank, it has a stack-connecting sleeve so that piping can be installed to carry the cleaned air out-of-doors. The design follows the code of certain states requiring outside exhaust and prohibiting the recirculation of cleaned air (such as New York, Wisconsin).

The unit is rated at over 1500 cfm. on a 6½-in. inlet. It has a 1½-hp. motor, a paddle-wheel fan and a dust drawer in the base for the removal of collected dust.



BELT CONVEYOR for use between punch-press machines where space must be conserved. Known as Press-Veyor, it is made in three models. New model has 4-ft. long conveyor bed, is powered by 1/3-hp. electric motor. Receiving end adjusts from 9 to 30 in. Delivery end adjusts from 39¼ to 61¼ in. Other models have 6- and 8-ft. long conveyor bed. Made by Rapids Standard Co., Inc., Dept. PV-3, Grand Rapids 2, Mich.

When you've got the RIGHT Tool Steel the job is half done



It often happens that a tool-maker has used a certain brand of steel for years, with good results. So he swears by this brand, and will assure you that it is positively the best that money can buy.

But then one day he uses this steel for a job that is just a little different from any previous job . . . and it is a complete failure. He just can't believe it, first . . . then he's puzzled. As he thinks it over he decides that the trouble lies in the heat-treatment, the design . . . or even in his own workmanship. So he tries again. And again the result is failure. Finally he admits, reluctantly, that his trouble came from using the wrong steel. The steel itself was good enough, but it just wasn't suited for that particular job.

Choose your tool steel carefully for each different application. It pays. And remember that no one tool steel can possibly cover a wide range of tool and die jobs. But there are five distinct grades of Bethlehem Tool and Die steels that cover most requirements:

CARBON Tool Steels—for genetal-purpose tools

BTR (Bethlehem Tool Room)—a safe-hardening tool and die steel

BA-H (Bethlehem Air-Hardening)—a die steel for minimum distortion

LEHIGH H TEMPER—a die steel for maximum production

OMEGA—engineered for shock-resisting applications

Selecting the right steel for every job is not always easy. That's why Bethlehem's staff of metallurgists is at your service to help you solve tool steel problems. Plan now to take advantage of this complete tool steel service. Just call the nearest Bethlehem district office or distributor for full details.

BETHLEHEM'S

Complete

TOOL STEEL SERVICE

PROMPT DELIVERY

TOOL STEELS for EVERY JOB

METALLURGICAL ASSISTANCE

Distributors and offices everywhere

★ BETHLEHEM STEEL ★

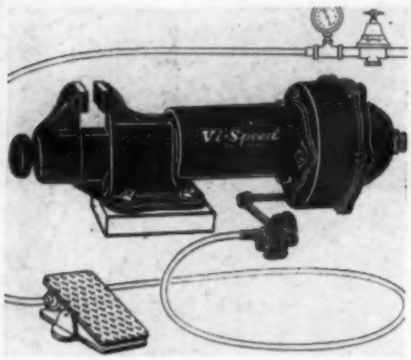
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Severance High-Speed Lab Mills Offered in Ten Standard Shapes

High-speed 3/32-in. shank Lab Mills have been announced by Severance Tool Industries, Inc., Saginaw, Mich. They are used in making small, intricate parts such as dies and molds, aircraft parts, diesel injectors, dentures and die castings.

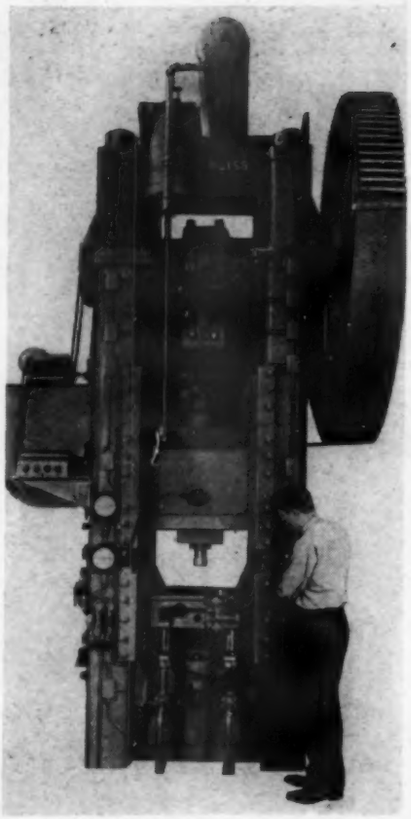
They are available in the ten shapes illustrated with 1⅝-in. overall length. Cutting-head diameters are from 1/16 to 5/16 in., in 1/32-in. steps. They are made of the same steel used in Severance standard Midget Mills.



Van Products Holding Tool Operates in Any Position

Vi-Speed, a pedal-operated, air-powered holding tool is made by Van Products Co., Erie, Pa. The unit includes vise, air cylinder, foot-pedal valve, air-pressure regulator, gage and hose. The vise jaw is 4½-in. wide, has a max. 7-in. opening and a max. stroke (air) of 1¼ in. Pressure can be from 0 to 3½ tons and is 50 times available air pressure. Recommended working air pressures are 15 psi. minimum and 150 psi. maximum.

The unit may be installed in any postion. When vertical, it can hold work for operations such as forming, punching, pressing bushings and straightening. More than one unit may be synchronized with single control to hold work of any length and varying thickness.



A triple hydraulic motion is built into the press: floating die table, core rod and stripper

Complex Powdered-Metal Parts Made on Bliss 345-ton Press

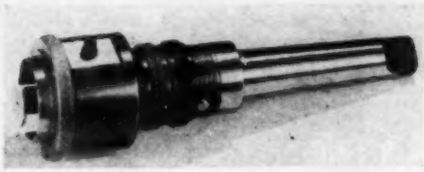
A briquetting press designed to produce large, complex powdered-metal parts is announced by E. W. Bliss Co., 450 Amsterdam Ave., Detroit 2, Mich. Known as No. 309, it is a mechanical press with 345-ton slide capacity. The slide has 10-in. stroke (which can be adjusted to 5 in.) and carries an adjustable cam which actuates the powder hopper.

The hydraulically controlled floating die table and core-rod rams recede against pressure predetermined by simple, independent adjustments. This feature has the effect of squeezing the powder from top and bottom and is said to provide uniform density of finished parts.

Slide speeds from 6 to 9 or 9 to 18 strokes per min. are adjusted on the speed control of a variable-speed motor. Change from one range to the other is made by shifting a dog clutch in the two-speed gear box by means of an external lever.

All hydraulic cycles are actuated by the mechanical cycle, either by contact with the die table and core rod or by a rotary limit switch. The exception to this rule is when the selector switch is set for hand operation and the core rod and stripper can be moved up or down at will.

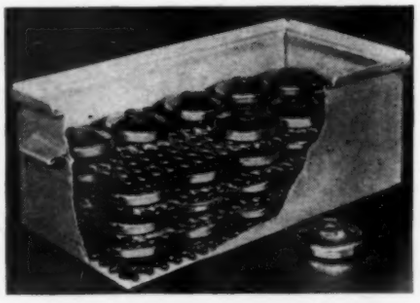
The mechanical cycle can be inched for set-up, single-stroked for tryout, and run continuous for production. Electric timing devices make possible many combinations of the three lower movements. Table and rod can be kept stationary while stripper moves. Strokes of die table and core rod are 3 in.; stroke of stripper is 6-in. The die is filled and parts ejected by an automatic hopper feed.



Maxwell's Recessing Tools Do Back-Facing, Grooving

A line of precision recessing tools capable of back-facing, grooving and similar operations is available from The Maxwell Co., 300 Broadway, Bedford, Ohio. The tools are made in four sizes for holes from ⅜ to 1, 1 to 2, 2 to 3 and 3 to 4 in. They can be used in drillpresses, boring mills, turret lathes, automatics and milling machines.

When the recessing tool is attached for operation, the pilot enters the work, and the cutter is fed a predetermined amount by means of a rack-and-gear mechanism. Depth of cut is controlled by adjustable stop limits, and tolerances are said to be held to within 0.001 in. The unit is designed to take cuts at high rate of feed with only finger-tip pressure.



SEPARATORS are made of woven wire screen (or expanded or perforated metal) in all mesh and sizes, completely covered with rubber. They will keep parts from becoming scratched, and can be used for palletizing, stacking or draining. Furnished in sizes to meet specific needs and with various grades of rubber. Made by Automotive Rubber Co., Inc., 8669 Epworth Blvd., Detroit 4, Mich.

CORRECTLY hardened under modern scientific control and then finished after hardening by the exclusive HANSON PROCESS, these taps are truly Precision Tools. That is why they cut clean, accurate threads, deliver an extra amount of work between grinds and stand up to the limit on tough jobs.

Result: Lower cost per tapped hole, and good reasons why you should use Hanson-Whitney Taps.

Our engineers would welcome the opportunity to study your tapping problems — write today.

Hanson-Whitney

MACHINE COMPANY

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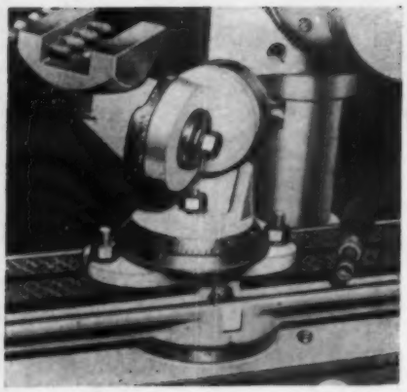
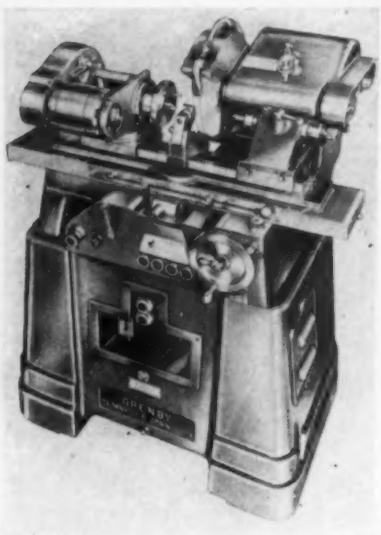


UNIVERSAL FIXTURE holds all types of lathe tools for grinding. Four graduated quadrants permit fast, accurate setting of any simple or compound angle. It is designed primarily for carbide and high-speed tool grinding, but will do other work. Vise is 1½ in. (2-in. vise is available). Unit fits almost any make of cutter or surface grinder. Made by K. O. Lee Co., Aberdeen, S. D.



Two Grenby Hydraulic Grinders Do Internal or External Work

Two hydraulic grinders have been added to the line of Grenby Mfg. Co., Plainville, Conn. One, the EG-103 universal external grinder, has a recommended capacity for work of 3-in. dia. times 10 in. long between centers. The other, IG-103 universal internal grinder, has a capacity for internal work of 3-in. dia. times 4-in. long. Either machine can be equipped with two heads to make a combination internal-external grinder. Both can actually grind work up to the full 9-in. dia. swing over the table.

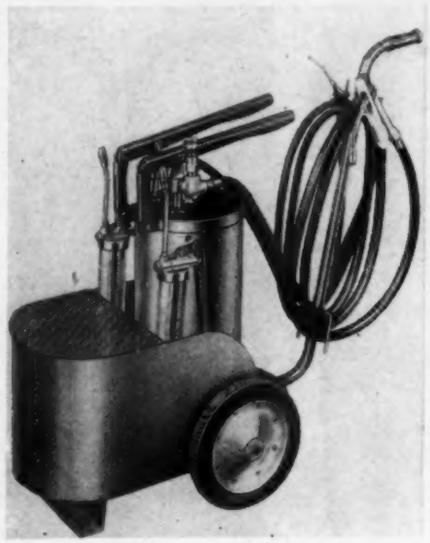
Primarily toolroom equipment, the grinders have features said to make them successful for production work. These features include: accurate stops for maintaining size, lever collet closer, semi-sizing diamond dresser, and coolant system. The live-spindle workhead takes 5C-1-in. collets and swivels 90° either side of center. Three- and four-jaw chucks, faceplates, or a dead-center attachment can be held by the taper bayonet-lock spindle nose. The grinding-wheel head swivels 15°.

A ¾-hp. motor drives the 10x1-in. external wheel or the 15,000- and 32,000-rpm. internal spindles. The table has infinite speed change from 0 to 100 ipm. It oscillates from 1/32 to 10 in. and will still power cross-feed at either or both ends of the stroke.

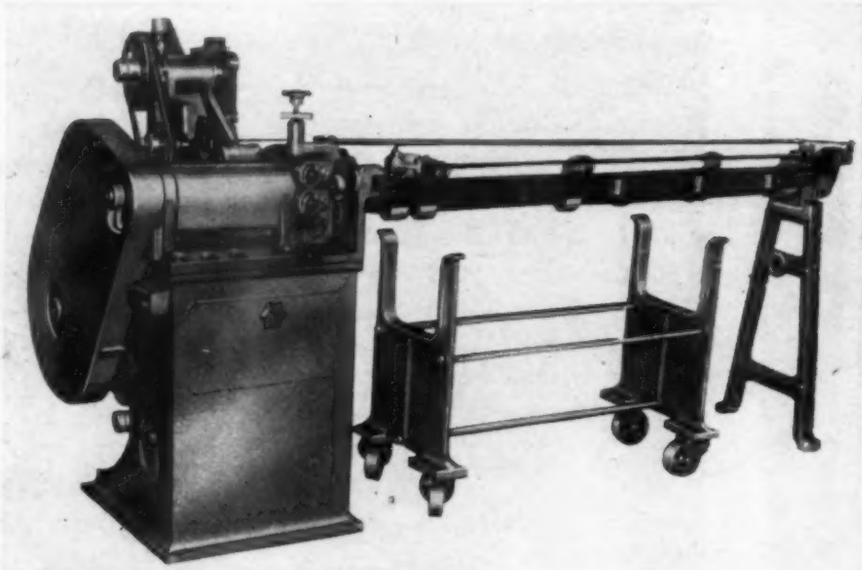
Internal Radius-Boring Tool Made for Lathes by McKenzie

An internal radius-boring tool has been developed by McKenzie Engineering Co., Newton, Conn. It can be made to fit the taper of a lathe tailstock, to be held between centers, or to fit in a turret lathe. It is said to have an easy feed that provides smooth radius. It can be set for any radius within its limits.

Two sizes are illustrated with a few samples of parts that can be produced, including two self-aligning bearings or pillow blocks of different sizes and a self-aligning connecting rod which would be two end rods if cut in half.



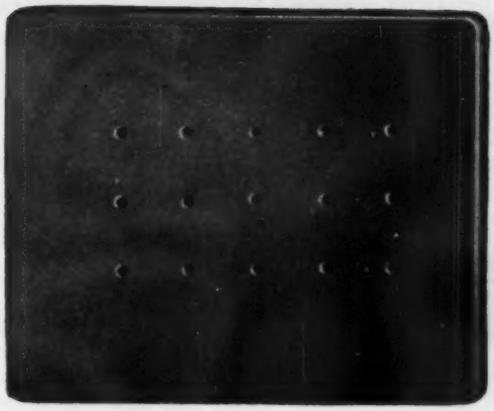
SERVICE CART is complete lubrication department on wheels. Made by Industrial Div., Gray Co., Inc., Minneapolis 13, Minn., the Graco Lube unit carries supply of three different lubricants, two 1-lb. lever guns, one ½-pt. Pistol oiler and a large tool box. Pressure-lube pump has built-in Gun Loader for hand guns



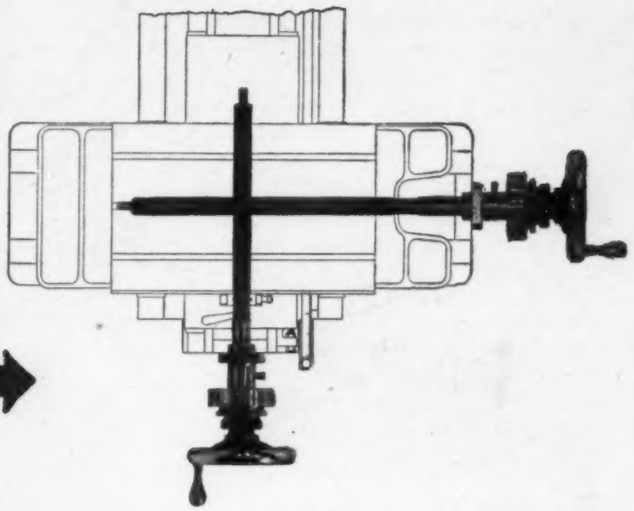
WIRE-STRAIGHTENING and cut-off machine made by Dore Mfg. Co., Inc., Grayling, Mich. Designed for flexibility of operation, it has a capacity from 0.040- to 0.156-in. dia. wire. Production is said to be 10,000 pieces per hr., based on the straightening and cutting off of 9-in. lengths of 0.040-in. dia. wire

15 holes in 15 minutes

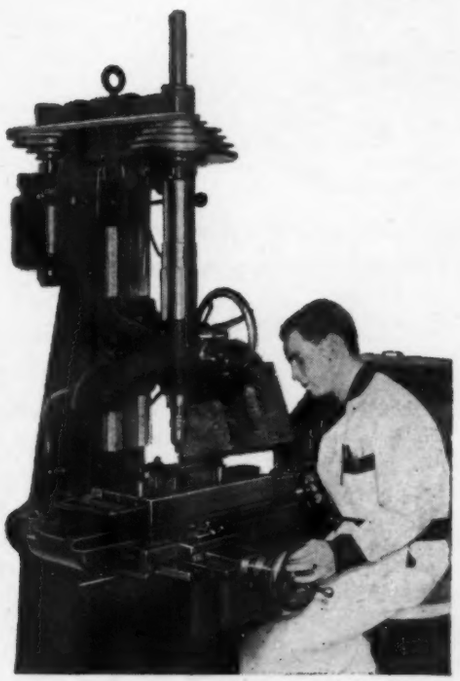
Spotted, Drilled and Reamed to ±.0002"
by the
Coordinate Hole Location Method*



...because
Micrometer Lead Screws
Accurate to
.0002" in 16 inches



...Speed Table Settings
on the
MOORE JIG BORER



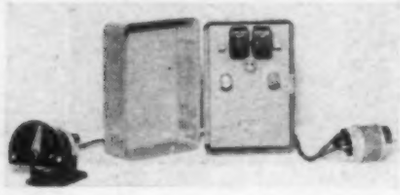
*One boring out to increase accuracy to ±.0001" would require only five minutes additional time for all fifteen holes. Write for descriptive literature.

MOORE TOOLS

MOORE JIG BORER

MOORE SPECIAL TOOL CO., INC., 87 Union Avenue, Bridgeport 7, Conn.

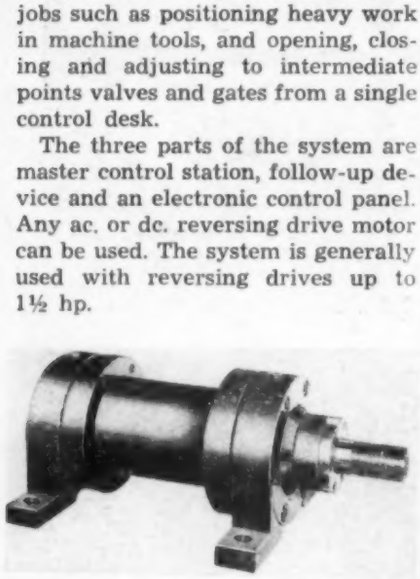
Parts and Materials



GE Electronic Control System Positions Machine-Tool Work

An electronic positioning control system has been announced by Control Div., General Electric Co., Schenectady, N. Y. It is designed to perform jobs such as positioning heavy work in machine tools, and opening, closing and adjusting to intermediate points valves and gates from a single control desk.

The three parts of the system are master control station, follow-up device and an electronic control panel. Any ac. or dc. reversing drive motor can be used. The system is generally used with reversing drives up to 1½ hp.



Lindberg Oil-Hydraulic Cylinders Take 1500-psi. Working Pressure

An improved line of oil-hydraulic cylinders is available from Air and Hydraulic Div., Lindberg Engineering Co., 2444 W. Hubbard St., Chicago 12, Ill. The cylinder heads are flame-cut and machined from steel mill plate. Ports can be easily repositioned to suit particular applications.

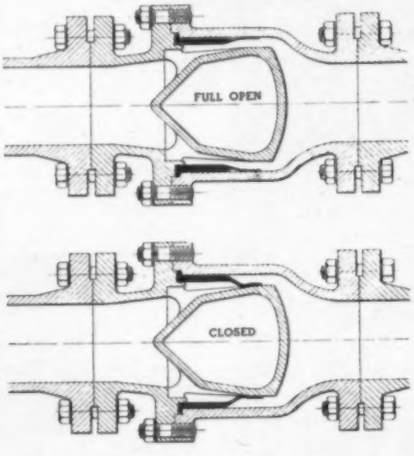
Neoprene O-rings replace conventional gaskets. The sealing action is automatic: the higher the pressure, the tighter the seal. All screwheads are in the open and are readily accessible. C-ring construction eliminates the necessity of tie rods and reduces required installation space. The cylinders are designed for 1500-psi. working pressure.

Sherman Diffusion Paste No. 50 Brazes Carbide Tips to Shanks

A paste for brazing carbide tips to steel shanks has been developed by Sherman & Co., 197 Canal St., New York 13, N. Y. Known as Nu-Braze silver-alloy Diffusion Paste No. 50, it consists of a finely pulverized silver-brazing alloy ground with a proportion of special flux.

The flux begins to melt at 480° F. It forms a liquid protective film to protect both tip and joint area before heat-generated oxides form. The viscosity of the flux is said to be so low that the alloy component eases all of the flux out of the joint.

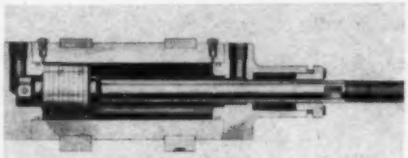
Tips are prepared in the usual way. The paste is painted on the joint surfaces of the carbide tip with a small brush. The tip is then held in position and heated.



Improved Grove Chexflo Valves Control Flow with Rubber Lip

Chexflo valves which have no operating metallic parts to stick, slam chatter or leak are available from Grove Regulator Co., 65th & Hollis Sts., Oakland, Calif. Operating on low pressure differential, the check valves can handle air, gas, water and refined petroleum products at temperatures to 180 F. Sizes range from ½ to 12 in.

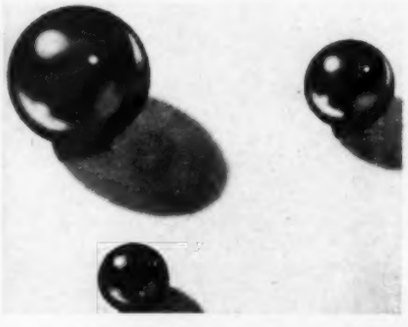
Main feature of the Chexflo valve is a tough tubular flexible operating member, comprised of a thick section tapering down to a sensitive operating lip. It requires no pressure differential to provide positive shut off. The synthetic rubber lip expands freely to open and permit flow. Its elasticity causes it to contract on slack flow prior to the start of back flow. As the lip closes, the flow velocity increases and flushes the surface of the seating member so that it will be free from small particles.



Hydro-Line Hydraulic Cylinders Take All Conventional Mountings

A line of standard hydraulic cylinders is announced by Hydro-Line Mfg. Co., Rockford, Ill. Body of the cylinders is centrifugally cast semi-steel with 40,000 to 55,000-lb. tensile strength. The line includes all conventional types of mountings and ranges from 1½- to 8-in. bore with stroke to suit. Cylinders are rated at 1500-psi. capacity.

There is a ½-in. cushion at each end. The design incorporates C-ring packing with three rings plus the header and follower. Cylinders are bored and honed.



SOLID CARBOLOY cemented-carbide balls ground to 0.0002-in. tolerance on the diameter are available from Carboloy Co., Inc., Detroit 32, Mich. Used in check valves and for sizing and burnishing, they are standard only in Carboloy grade 44A. Ten sizes run from ⅛- to 1-in. dia.

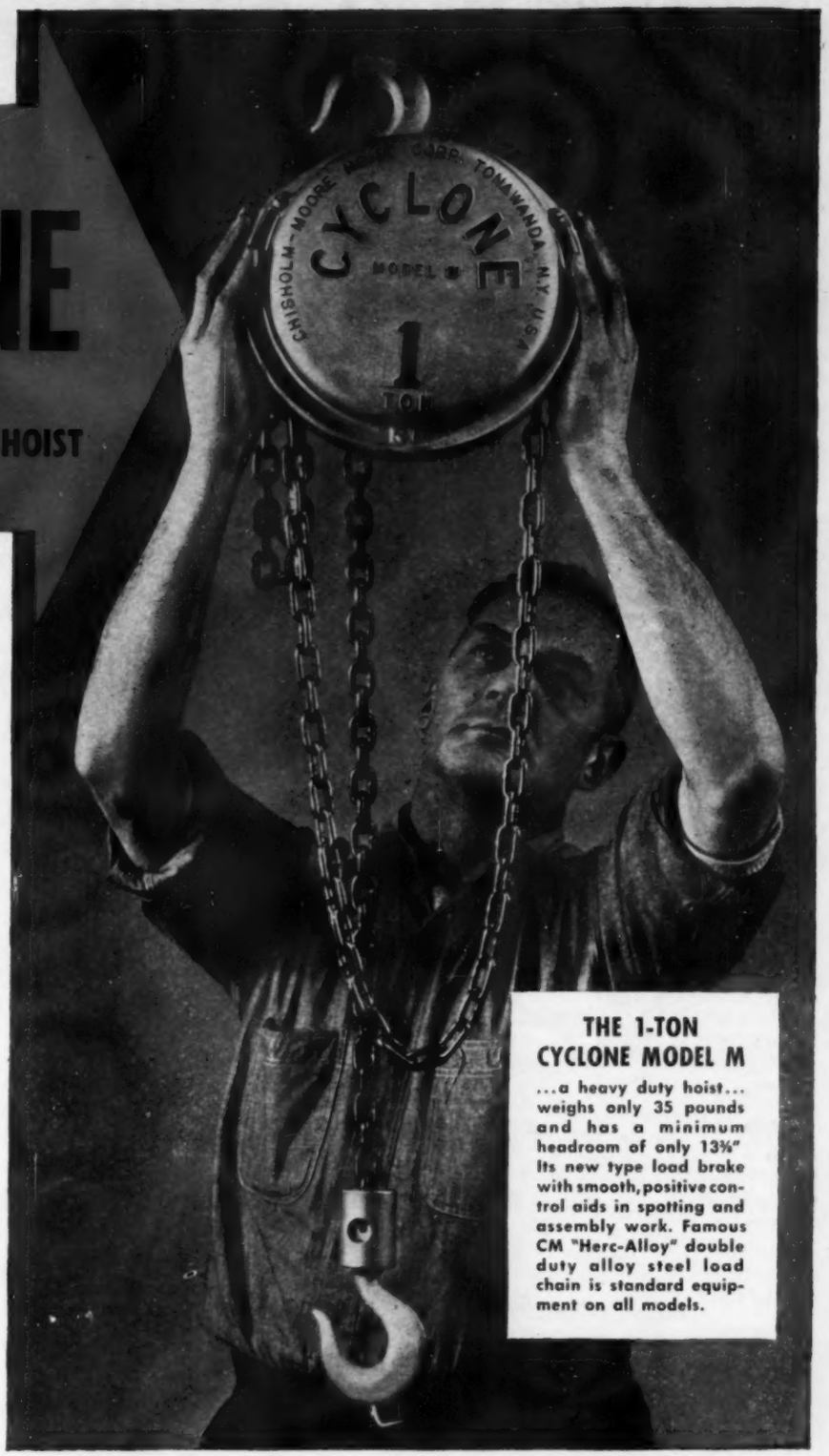
NEW

CM CYCLONE

Model M

HEAVY DUTY HIGH SPEED HOIST

Capacities from ¼ ton up



No matter how you look at it...design, construction, durability, efficiency...the new Cyclone Model M Heavy Duty Hoist outclasses all other hoists by a wide margin. For the Model M is fundamentally different...and better...a true production line tool. Today's stronger alloys of steel and Alcoa aluminum, compact design, precision ball bearings at all rotating points and sealed-in lifetime lubrication combine to make the Cyclone Model M lighter, stronger, more efficient and easier operating. Thousands are already in service on a multitude of factory jobs daily demonstrating their superior performance. *Ask your distributor* to show it to you.

THE 1-TON CYCLONE MODEL M

...a heavy duty hoist... weighs only 35 pounds and has a minimum headroom of only 13⅜" Its new type load brake with smooth, positive control aids in spotting and assembly work. Famous CM "Herc-Alloy" double duty alloy steel load chain is standard equipment on all models.

LOOK AT THESE ADVANTAGES

96% EFFICIENCY

conserves worker energy and increases productivity

42% FEWER PARTS

simplifies maintenance

63% LESS WEIGHT

yet definitely a heavy duty hoist

Plus SEALED-IN LIFETIME LUBRICATION

prolongs life...reduces wear

Plus HERC-ALLOY

America's First and Safest Steel Load Chain

CHISHOLM-MOORE

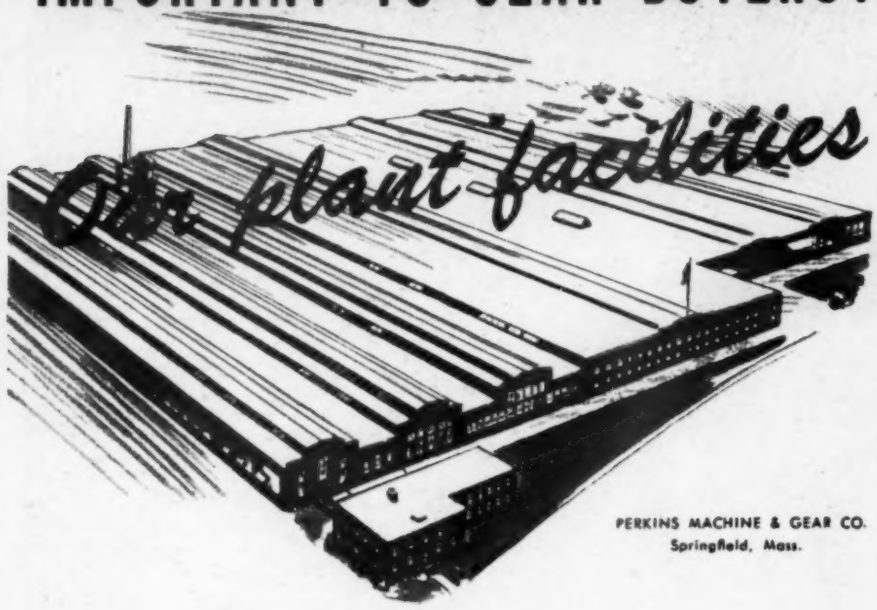
HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.

SALES OFFICES: New York • Chicago • Cleveland • San Francisco • Los Angeles

IMPORTANT TO GEAR BUYERS!



PERKINS MACHINE & GEAR CO.
Springfield, Mass.

MORE IMPORTANT TO YOU....

Our reliability

A manufacturer who is in the market for gears takes for granted that any old-established gear producer would be capable of doing a job for him. His assumption is correct.

We freely concede that our organization does not have a monopoly on the entire country's gear engineering brains. However, in the manufacture of custom-cut gears, there often is a distinct difference between a given number of finished gears that "get by" upon inspection and those that are "right on the button" This difference cannot always be expressed in terms of gauge tolerances.

Here at Perkins we like to believe that our men in the shop are not only *capable* of doing a good job but in addition—like true New England craftsmen—have the *desire* to do it. *That*, sometimes, makes a lot of difference in the mechanical performance of a gear.

YOU FURNISH THE SPECIFICATIONS • WE'LL PRODUCE THE GEARS

PERKINS Precision, Custom-Cut GEARS

PERKINS MAKES: Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears, Ground Thread Worms

PERKINS MACHINE & GEAR COMPANY • Springfield 2, Mass.

ROUND TABLE Discussion

IS APPRENTICESHIP SLIPPING?

Apprenticeship is definitely slipping, and where a proper apprentice training scheme is operated, the training is often too specialized to be of general use elsewhere.

Many firms take apprentices, but do not trouble with their training. Classroom instruction and demonstrations do not greatly assist a boy in becoming a good workman and often apprenticeship schemes are overloaded with this.

A properly trained apprentice is an asset to his master, and I should consider it a good policy if a group of firms could have an apprentice-training scheme with an interchange of apprentices between firms. The workman would therefore be trained by not one firm but a group of firms. This form of training might be a trifle expensive, but the better work turned out would more than compensate for this.

Unsuitability to the work can be avoided by making all boys serve a trial period before being accepted for training. Some foremen will neglect to train a seemingly dull boy. Firms improperly training boys would soon be found out by an interchange system.

W. E. Warner
Essex, England

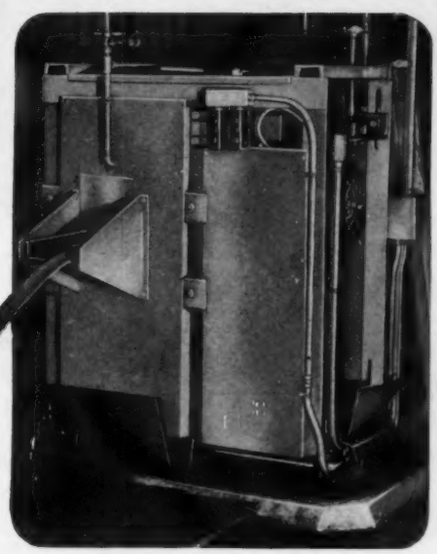
•

WHO PAYS FOR BREAKAGE?

In a certain firm the quickest man was rewarded with an increase in pay and all men were charged with half the cost of tools carelessly broken. The term "carelessly" left much to be desired. Twist drills were included in the list of tools. Happily, such a practice is exceptional.

Where less-frequently needed tools are concerned, it is common sense that these should be provided by the firm and be available on loan from the tool stores. Their safe custody, however, presents a real problem.

In the ordinary course of works, a man is bound to leave his machine sometimes. If on one of these occasions such a tool gets stolen or borrowed and damaged, the man to whom the tool was issued will be held responsible. However, seeing that fellow-workers are selected by the employer, the loss should rightly be borne by the firm. Also, should a tool on loan be damaged when in use, due care having been observed,



BRUSHES GOT THIS JOB OUT OF A "PICKLE"

THIS manufacturer of thermostatic bimetals for temperature control was literally in a "pickle". Following annealing operations, the material was transferred to pickling tanks for removal of the scum and scale it had accumulated. It came out of the tanks clean but there was a high scrap loss due to resulting corrosion.

Then brushing was suggested. A special machine was developed through which the metal strip is fed between two sets of power driven Osborn Master wire wheel brushes. It moves through fast, emerges sparkling clean. There is no material loss and the smooth brushed surface makes the strip easier to re-roll. Illustration at top shows unit designed to brush light gauge metals and the enclosed machine shown in the inset services the heavier gauges.

Many plants are today using Osborn Brushes to speed production, save time and money. But others are missing these benefits, not aware of the important production jobs being done by modern brushing methods. Let an Osborn sales engineer introduce you to brushes not as a product but as a process with a proved record for cutting costs.

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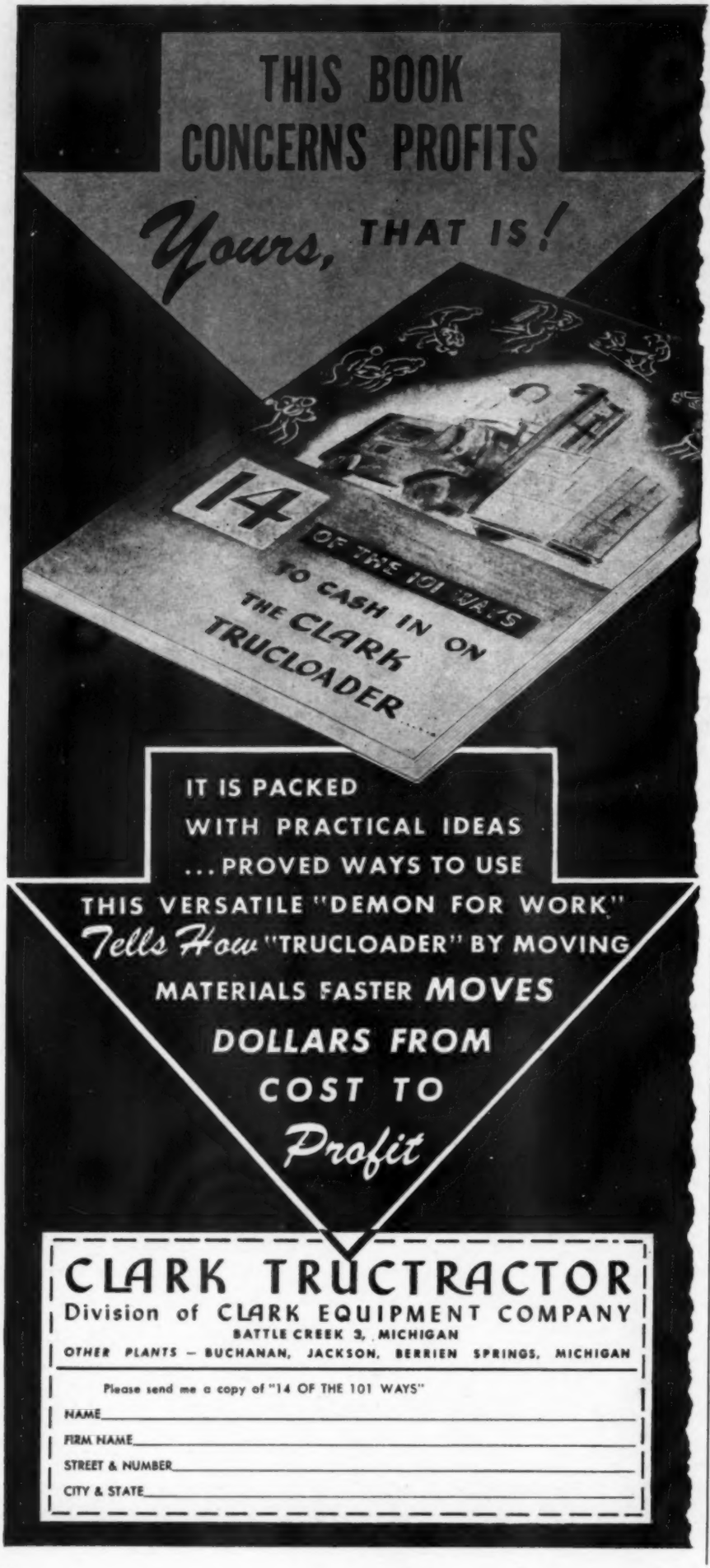

the firm should bear the tool loss.

On the other hand, if a tool is lent to another man, whether it belongs to the firm, or is privately owned, and is lost or damaged by that man, the question should be between the two to settle. Even as a workman would not expect his employer to make good tools stolen from his house, neither should he expect replacement by his employer because the geography is changed. Some men as a safety measure put all their tools into their pockets when they leave their machines, presenting a comical sight.

Of an entirely different character is unavoidable damage. The responsibility is rightly that of the employer. Even when protective measures are not specified by law, the enlightened employer often provides them as a matter of equity. For the same reason, he provides all essential tools and thus renders the provision of privately owned tools unnecessary. When this is the case, the question of responsibility for loss or damage does not arise.

J. E. Powell
Lincoln, England

CAN YOU AID THE LEMON?

A man who had been moved from one department to another and from one gang to another until he was classed a lemon by the vast majority in the organization, was as a last resort (in the hope that he might quit) given what was considered the hardest, dirtiest, and most undesirable job in the shop. He was in a corner where he had little if any contact with other men. However, he seemed comfortable and contented, worked hard and scarcely ever exchanged a word with anyone. In that place he proved to be a valuable employee who stayed for many years —in fact until the shop was moved to a distant city.

Another man who came under my observation was gifted with a lot of know-how. He had an excellent manner of expressing himself, but made it a rule of his life never to do any manual labor that he could get anyone else to do. Naturally he was not popular. He was shifted around from place to place, the management hoping that he might be placed where his knowledge could be used to advantage. He was finally given charge of a group, most of whom soon drifted away until only two men remained, one of whom was serving an apprenticeship, and the other who was a willing laborer.

The apprentice found that under this man's instructions he was learn-

POP'S SCHOOL of FILING

"PLAY IT SAFE WHEN FILING A DIE"—says Pop the Foreman

THE exacting requirements of diemaking put an extra-high responsibility on using *The right file for the job.* To guard against irregularities, inaccuracies, or too much metal removal, many operations (as in corners) call for machinists' files with at least one "safe" (uncut) edge. Accurate cut, uniform hardening, and absolute straightness are likewise essential. These qualities are scrupulously maintained in Nicholson files. They are reasons why expert diemakers, by a large majority, choose this world-famous brand.

Action and close-up views show the Nicholson Hand with one "safe" edge. A good complement of machinists' files suitable for general diemaking consists of the following shapes and cuts for "roughing" and finishing.

HAND – *Bastard double cut with one "safe" edge.*
HAND FINISHING–*Smooth double cut with two "safe" edges.*
PILLAR–*Bastard and Smooth double cut with one "safe" edge.*
SQUARE BLUNT – *Bastard double cut.*
ROUND – *Bastard spiral (double) cut.*
HALF ROUND TAPERED – *Bastard double cut back and flat side; Smooth single cut back and double cut flat side.*
THREE SQUARE TAPERED–*Bastard and Smooth double cut.*

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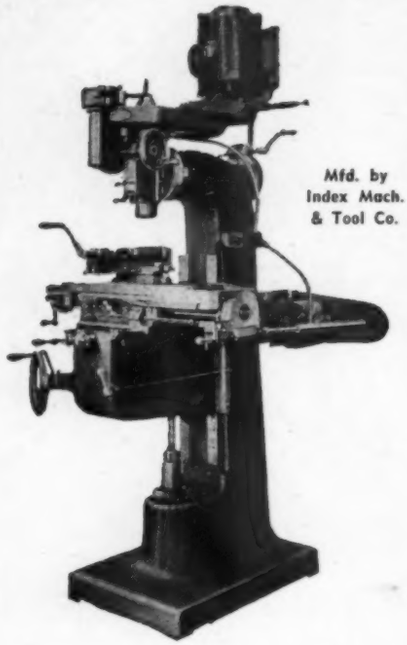

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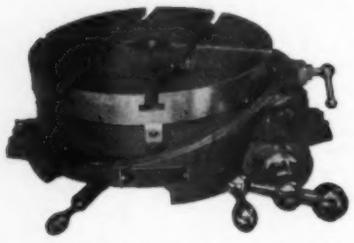

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ing more every day than he had previously in a week. He was glad to do work that would count to his foreman as well as to himself. The helper was kept happy and working by the jolly talk of his foreman and the three worked together for a long period.

John Mark May,
Watervliet, N. Y.

•

The "lemon" presents a capable challenge to Al's foremanship and supervisory ability. This worker must have had certain satisfactory qualities which enabled him to retain employment for three years—qualities that apparently outweighed his undesirable traits. Al demonstrated sound reasoning in permitting the "lemon" the opportunity of working for him, not against him.

The "lemon" may pick a fight with his job, not with the foreman or the other workers. Al's action is a challenge to the worker to prove his right to continue employment with this tolerant employer.

William E. Kaufman
Philadelphia, Pa.

•

The late Will Rogers once said, "I never met a man I couldn't like." It was Will's way of saying there was always some solid human quality to be found in even the most unlikely of his fellow men.

Because Al has the same slant in his approach to human relations, I feel sure he can make something of the situation presented by the so-called lemon.

During the war I worked with a foreman in a large government plant who had a reputation for fitting square pegs into round holes. Before a man reported for work in his department this foreman had a talk with the transferee's previous foreman or foremen and found out just what his shortcomings were, his background, education, and life outside the plant. When the man reported for work he was met with a friendly handshake and invited to sit down and talk things over in private. Any hositility or reserve at the start of the interview was soon dispelled by the foreman's friendly approach. In the course of the conversation, the employee was encouraged to discuss his relations with previous supervisors, what he expected from his new supervisor, and the type of work he preferred. Before the talk was over, a good idea as to where the new man would fit in the departmental family was established. At the close of the interview it was made clear that the employee started work with a clean slate.

How well the foreman succeeded in solving problems with employees is a matter of Navy Department record. Several of his "problem children" figured prominently in employee suggestion awards and citations. One of them received the highest possible award for a suggestion that is now standard equipment on all Navy vessels.

Robert S. Alexander
East Providence, R. I.

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SNOOPERVISOR

Anything analogous to a "little black book" is cause for alarm among the men. Most me nare more or less afraid of losing their jobs—hence suspicious of any checkup.

A partial explanation of the reason this feeling thrives actively, continuously and yet unnoticed or ignored by "white-collar" men lies in a curious fact:

My observations of workers ranging from "pick and shovel artists" to skilled tool and die men (in the pre-war sense) has indicated suspicion to vary in the mass directly with the amount of mental absorption required by the task. This suspicion is not a thing of which white-collar men themselves are devoid—with them it is merely more the case of the individual and the organization of which he is a part, and on the worker's part it is "front-office" policy.

Thus, I feel that the idea of "casually leaving the little black book in plain sight for all to see" is definitely erroneous because in this task of allaying suspicion there can be no such thing as over-selling, nor should there be any implication of a one-treatment, sure and permanent cure. Especially when it is remembered that shop gossip requires little truth at origin, no facts for distortion and less thought in infection.

A. M. Elliott
Le Roy, N. Y.

•

WHOSE JOB IS LABOR RELATIONS?

Confining the topic to large factories, which have separate labor relations departments, let us say someone does come forward with a grievance. Maybe the foreman tries to help and maybe not. He should, because he understands more than the front office, being in close contact with the

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IT PAYS to know your KENNAMILLS
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worker. The foreman who is thoughtful, considerate and conscientious in his work, would try to iron out the trouble as much as possible. It would indicate his real worth to the company.

Let's consider what would happen if the boss refused to be patient enough to listen to the grievance the worker presents. The case is referred to the "front office." If the foreman does this time after time, someone "higher up" is going to notice it, and consider the foreman incapable of handling his department and men.

There are large numbers of small factories who have only employment managers. How could the department head send the worker to this office, with its limited capacities? The foreman must keep up worker morale. Of course, if a problem gets too big for him, he should call in his immediate superior.

Labor relations is everybody's job, not just anybody's, from the employee to the president, for the sake of labor peace all over the country.

Edward Diskavich
Torrington, Conn.

•

The need of labor relations increases as a concern grows. Naturally, when a concern is small each individual is obliged to oversee many different shop problems. As the business grows and additional help is required, departmentalization is necessary and responsible heads for the various sections must be appointed. A specially trained man for any particular job can concentrate on his particular line and can do a better job than one whose time and thought must be divided up over many aspects of the business.

Martin H. Ball
Watervliet, N. Y.

•

There was a time when shop supervisors were responsible for everything pertaining to running the shop, whether it was hiring or firing, giving a raise, or being instrumental in changing a man's job. Now the personnel office and union officials have practically eliminated the foreman from labor policies and from many other functions that were at one time considered part of his job.

The personnel office has taken over the responsibility of the men to the extent that a foreman cannot change a man from one machine to another or give him a raise. Shop stewards of the union in charge can and do tell foremen what has to be done, although it is often wrong, but to prevent trouble the personnel office and management go along with the union officials in their views.

A production engineer, outlining production requirements for the month at a foremen's meeting, ended his speech with: "We have provided you with the latest and most efficient equipment available; the men are well paid and enjoy good working conditions. Your job is production and nothing else. We have taken care of everything so that your whole energy can be devoted to that end. Keep your men happy and contented. See that every piece of equipment is efficiently produced. That is your only responsibility."

I believe that good labor relations today between union workmen and employers can only be achieved by the personnel office, foremen and union representatives working together, because foremen know more about the men, their working conditions, their good points, also their shortcomings, than any labor representative or personnel official ever will.

Arthur Silvester
Niantic, Conn.

NEW BOOKS

ALUMINUM ALLOY SELECTOR—*Published by Reynolds Metals Co., Dept. 47, 2500 S. Third St., Louisville 1, Ky. Slide-rule chart. Price $1.*

Data on 18 of the most widely used aluminum alloys are combined in this selector. For each alloy the selector shows chemical composition, physical constants, maximum forging temperature, and heat-treatment cycles.

For seven different forms of each alloy, the selector shows tempers available, ranges of tensile and yield strength, hardness and elongation, and AMS, ASTM, Federal and Navy specifications.

•

MILLING WITH CARBIDES—*Published by Metal Cutting Tool Institute, 6400 Chrysler Bldg., New York 17, N. Y. 41 pages. Price $1.*

This report was compiled by a technical committee of the Milling Cutter Division of the Metal Cutting Tool Institute. General considerations including cost factors are discussed in an introductory section, followed by data on the characteristics of various grades and brands of carbide.

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and fixtures and the nomenclature for milling cutters are covered in detail. Factors involved in cutter design are considered and various types are illustrated.

Speeds and feeds and other operating data are presented, with special emphasis on sharpening and care of cutters. Illustrations and tables of sharpening data are given.

•

PLASTICS, THEORY AND PRACTICE—*By C. C. Winding, Professor of Chemical Engineering, Cornell University, and R. L. Hasche, Scientific Counsel, Tennessee Eastman Corporation, 280 pages. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Price, $3.50.*

This volume, which is included in the "Chemical Engineering Series," has for its objective the upgrading of the chemist and chemical engineer. The treatment presumes that the reader will be at the stage where he can readily and facilely refer to standard texts and handbooks for more specific information.

The technology of high polymers, with which the book deals, is a broad one, but even the expert will find that the fundamental factors relating to any specific resin or plastic are included. Methods of fabrication and application are given early in the book, before the reader becomes familiar with the various properties of the various classes of resins. The authors believe that the chemist and chemical engineer will grasp the chemistry and chemical structure of each resin quickly, but they may need specific information regarding methods of fabrication before they are able to relate specific properties with uses. A direct comparison may be made in the field of metallography, where the student is introduced to casting, machining welding and other processes before he becomes acquainted with the chemistry and physical structure of metals.

The possible combinations of monomeric materials in the synthesis of new copolymers is so enormous that only those which are now produced commercially or show promise are included in the text. Trade names of products have purposely been omitted from the body of the text, because it is felt that the polymeric materials should be recognized by their chemical type rather than as products of commerical exploitation. However tables are carried in the appendix referring to the commercial names of plastic products.

Following discussion of the specific polymers a brief summary is presented, giving properties and uses of materials, usually as molding compositions. A practical chapter is the one on general applications of resins as carried out under current industrial practice. Silicons of several types are covered in a chapter and methods of production are outlined clearly.

•

THE OPERATION OF JOB EVALUATION PLANS—*By Helen Baker, associate director, and John M. True, research assistant. Published by Industrial Relations Section, Department of Economics and Social Institutions, Princeton University. 112 pages. Price $1.50.*

The Industrial Relations Section published in 1946, a first report on wage determination—"Wages under National and Regional Collective Bargaining." The present report deals with wage determination under job-evaluation plans, while a third report, now in preparation, will cover development of wage policy.

The job-evaluation report places its emphasis on continued operation of such programs rather than on first installation, as so usually done. Basis for the report is information collected from a number of companies that had had at least a few years' experience with job-evaluation plans. Reports were received from 73 companies, with employees covered by job-evaluation ranging from 278 to 140,000.

Included in the report is not only a discussion of the general experience with job evaluation, but also detailed treatments of how installation conditions, internal administration, external economic conditions and union attitude can affect operation. Factors, selected and discussed as essential to successful operation of job-evaluation programs, are a carefully established plan, full approval of top management, union acceptance, adequate administrative controls and recognition of the importance of other factors than job content in wage determination.

This report is a valuable contribution to the actual data available on what is happening to job evaluation. It bears out the belief that job evaluation has a decided toehold in industrial wage determination and will keep it, despite its opposition by many union leaders who feel it limits collective bargaining.

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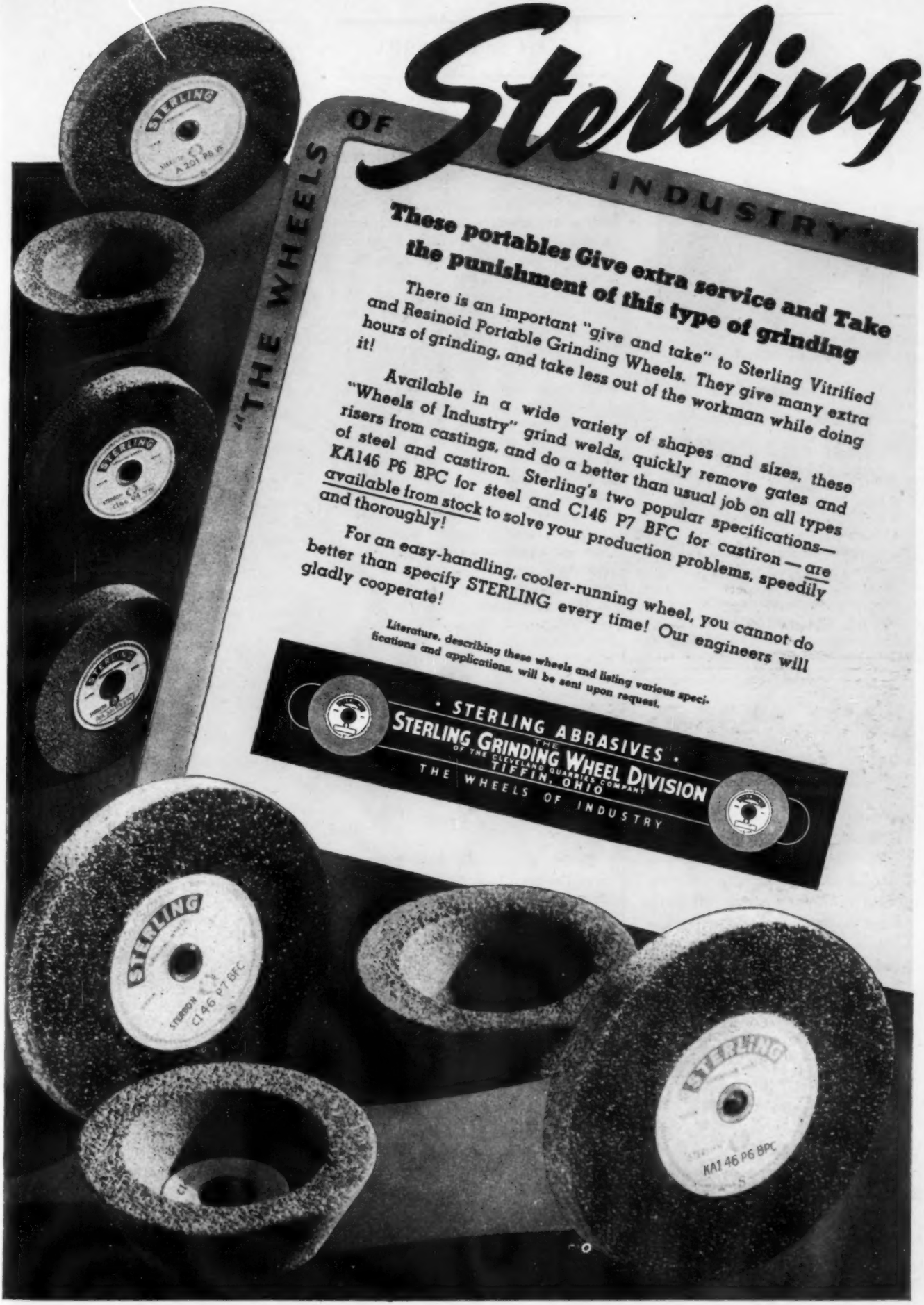

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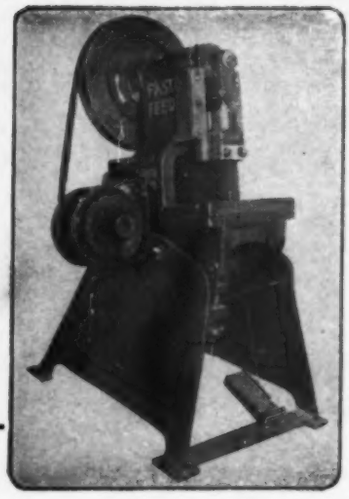

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SEEN and HEARD

By JOHN R. GODFREY

Calling Things by their Right Names

NOMENCLATURE, or the names of things mechanical, has long been one of my hobbies, not so much from a scholarly view (which I do not have) as for two other reasons. Most important is to have names mean the same to a man in Dexter, Me., as it does to one in Oshkosh or Kalamazoo. For if *drift* means a tapered key to use in driving a taper-shank drill out of a socket, tapered pin to line up holes in a boiler shell before riveting, and a hammer-driven broach, how is a poor dealer to know what is being ordered?

Another, though less-important reason, perhaps, is the advantage of having the name mean something to the man who uses it—to describe the tool itself as nearly as possible. The use of the same name tacked in the two or more different tools causes all kinds of confusion. One of the most glaring cases is the use of "hob" to designate both the tool for cutting gears in a hobbing machine, and the steel form that is used to force or sink an impression in a steel die or mold, as for plastic molding or for stamping silverware. Some shops avoid this confusion by calling the latter tool a "hub" instead of a hob. But when written it is easy to confuse the two and the term "force" seems to be a more logical choice, as it is more descriptive.

There is perhaps more confusion over the use of the word "automatic" than any other in common use. In the case of a turret lathe, we find the word "automatic" tacked on when the carriage is fed and the turret turned by power—in spite of the fact that the lathe must be stopped and the work loaded and unloaded by hand. An engine lathe with power feeds, controlled by cams or levers, has the same claim to being automatic. Milling machines are also classed as automatic when their feeds are controlled in predetermined cycles.

Many class these machines as semi-automatic, even though half, more or less, of their operations are performed without the aid of the operator. Often builders refer to such machines as having automatic cycles, which seems to be a happy selection. It would simplify shop terms and clarify understanding by both maker and used if such a designation were adopted.

The name "automatic" should be confined to machines in which the work is fed into cutting position without attention from the operator. This would include fully automatic screw machines, thread-rolling or other machines fed from a hopper, through-feed centerless grinders and similiar machines.

"Small tools" is another name which can mean several different things in different parts of the country. In some it means drills, reamers, taps, milling cutters and the like. For these the term "perishable" tools seems much more appropriate. Others refer to small machines such as bench drills, lathes, shapers and milling machines, though they are as much machine tools as their larger counterparts. Machinist tools, such as calipers, micrometers and scales, have also been called "small tools" in some sections of the country. Using the same designation for tools of different kinds has caused many delays and untold expense over the years.

The ASME has done good work in establishing standard terms for many things used in shops of many kinds. Many of their standards are now in use all over the country to the benefit of all. Agreement on shop terms and adherence to standards will save unnecessary delays and expense.

•

International Screw Threads

WHEN the Ottawa Conference on screw threads agreed on the 60° angle and the British agreed to drop the 55°, it seemed like plain sailing for a real standard. We, in return, were to change our ½-in. thread back to 12 tpi., where it was before we adopted the Franklin Institute or Sellers threads. This was a minor concession as compared with the thread angle. No, I'm told we are reneging on accepting this change and that another conference is to be held to secure agreement on that and some other points. As I recall the old taps (before we gave up the impossible V thread for the flat top and bottom) were 12 tpi. for the ½-in. size.

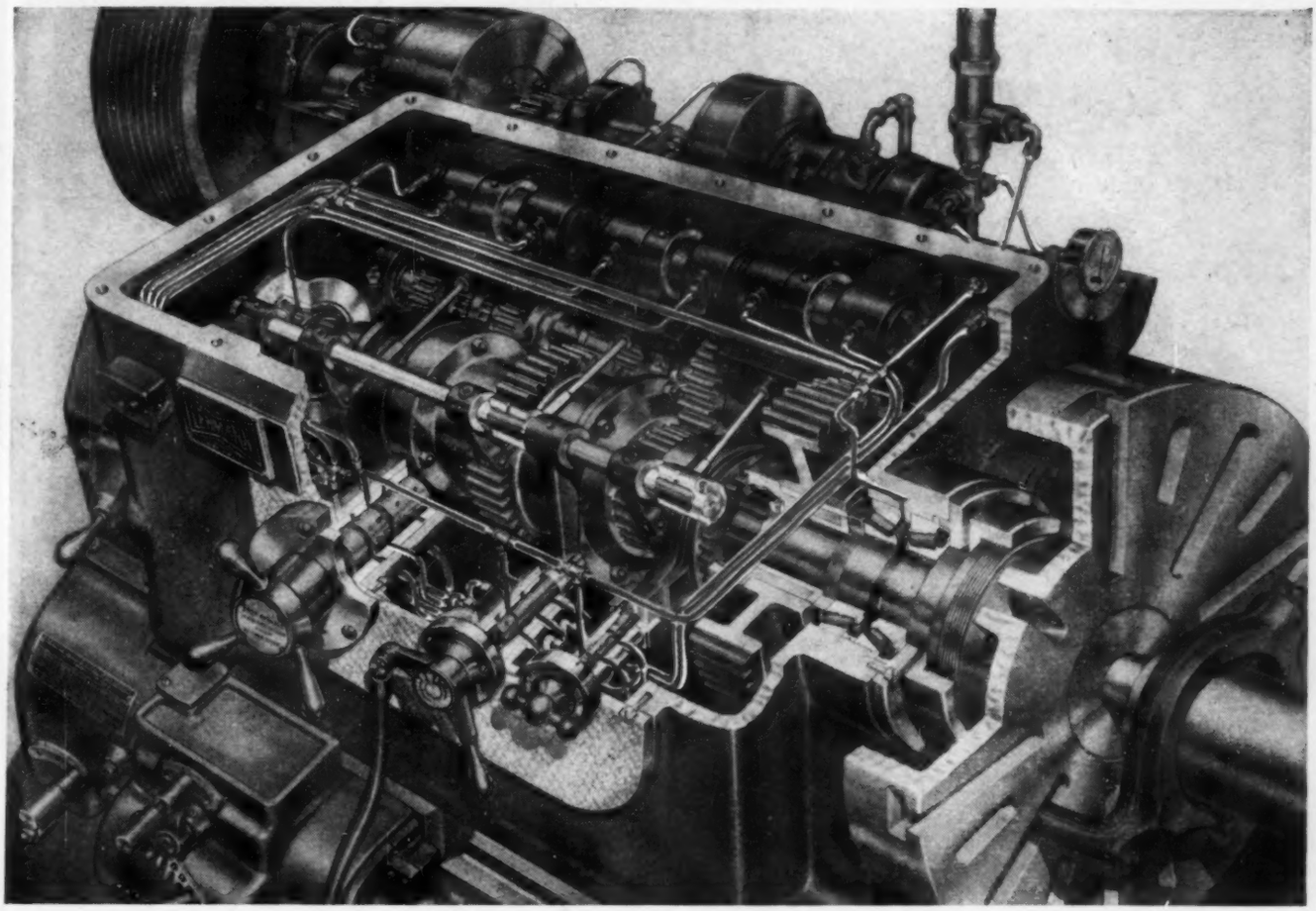
If we can get a uniform thread angle in exchange for changing the threads per inch on one diameter, it's a mighty good deal and there should be no hesitation in accepting it. Anyone who has worked on standardization committees knows that compromises are necessary to secure the adoption of any standard, and that it pays to do so.

Inside Knowledge on Lubrication Problems

— DEPOSITS —

This is One of a Series of Messages On Common Problems in Your Plant

This Oil Must Not Form Deposits!



HERE'S A SPOT in your metal working shop where freedom from deposits is vitally important.

If deposits do form inside hydraulically controlled machines, like this variable speed lathe, they will coat valves and sensitive clutch and brake mechanisms. The response to controls will be slow and sluggish. The accuracy of your work will be affected.

In extreme cases, the deposits may even clog the oil lines and "starve" vital bearings and gears.

The answer is an oil with exceptionally high chemical stability to resist oxidation and the formation of deposits under the strain of constant use over long periods.

After exhaustive tests, many builders of hydraulically controlled machines have approved Gargoyle D. T. E. Oil for this tough assignment. In addition, this superior Socony-Vacuum product has set outstanding performance records in thousands of machines.

Get Gargoyle D. T. E. Oil in your hydraulically controlled machines for smooth operation of sensitive controls, maximum protection against wear.

GARGOYLE Lubricants

SOCONY-VACUUM

SOCONY-VACUUM OIL CO., INC. and Affiliates: Magnolia Petroleum Co. General Petroleum Corporation

Socony-Vacuum Correct Lubrication

FOR EVERY MACHINE . . . EVERY OPERATING CONDITION

6 FISTFULS

OF LONG, RUGGED DUTY in GLOVES, MITTENS, PADS

Steel staple stitching at points of wear and tear make these AO Gloves, Mittens and Pads of chrome-tanned cowhide a sound investment in materials handling. They are flexible and comfortable to wear while protecting hands from rough stock. These highly serviceable products are part of a complete line of AO steel-stapled gloves and hand pads designed for specific jobs. Your nearest AO Safety Representative can supply you.

AO 1644 GLOVE—Extended glove life is due to steel-stapling of palm and fingers over reinforcing leather strips and steel-stapled leather patch on thumb. Also all seams on face of glove steel sewed. 4" gauntlet. For handling heavy castings, rough scrap in foundries, steel mills.

AO 1674 REVERSIBLE MITTEN—Double the wear because it may be worn on either hand. All seams *steel* sewed—to provide the strength to withstand the rough steel stock this hard-working mitten handles.

AO 1201 HAND PAD—Open back—fully protected thumb. Like the glove and mitten, the hand pad is made of top grade chrome-tanned cowhide. Reinforced with leather palm patch steel-stapled to palm.

Safety Division

American Optical COMPANY

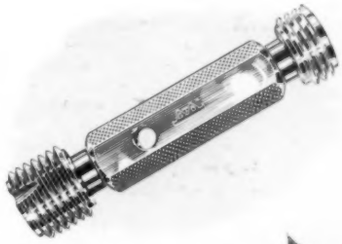
SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

IN GREENFIELD, THE ARMY GOT ITS GAGES

GTD "Greenfield" got into gage-making in a big way in World War I, the first mechanized war in history. Overnight, hundreds of new plants had to be rushed into production to meet the need for mechanized fighting equipment. And in all these plants, the No. 1 need was for gages — to guarantee absolute accuracy in mass production and to insure the interchangeability of parts. Long-time specialists in precision tool manufacture, GTD "Greenfield" had been making gages since the turn of the century — so the Army came to "Greenfield".

During World War I, GTD "Greenfield" turned out tens of thousands of gages. And ever since, it has pioneered in the production of thread gages, essential in this age of precision machinery — for war and peace.

Latest in GTD "Greenfield" gage-making has been the development of a new type of chromium-plated surface on gages. This exclusive plating method means a longer lived gage, more than makes up for their high first cost and results in worthwhile net savings. Thread gages as well as plain gages can be furnished with this chromium-plated surface.



GTD Greenfield 75th YEAR

GREENFIELD TAP and DIE CORPORATION
Greenfield · Massachusetts

The GEOMETRIC TOOL COMPANY
New Haven, Connecticut · In Its Fifty-Fourth Year
A DIVISION OF GREENFIELD TAP and DIE CORPORATION

"GEOMETRIC" CLASS SJ SOLID ADJUSTABLE TAP... Recommended for use where backing out time is unimportant and where space is limited. SJ Taps are available in sizes to cut internal threads from 1 5/16" to 8½" in diameter.

Backing GEOMETRIC Threading Tools...

What makes a perfect precision threading tool? At The Geometric Tool Company, in New Haven, Connecticut, they will tell you it's the combination of quality materials, skilled craftsmanship and pride in a job well done.

This Geometric worker is heat treating steel. He knows the material is good... his knowledge of the job is based on years of training and experience... and you can be sure that he will apply that knowledge in every way possible to insure a fine finished product. Proper equipment, efficient manufacturing methods and the skill of Geometric workers, all along the line, are your guarantee of the finest in precision threading tools.

• *Have you a copy of the new Geometric "Screw Thread Cutting Manual"? It is the most complete compilation of information about the proper care and use of Die Heads and Collapsing Taps ever published. We will be pleased to send you a copy on request on your company letterhead.*

THE
GEOMETRIC
TOOL COMPANY · NEW HAVEN 15, CONN.
A Division of Greenfield Tap and Die Corporation

PRECISION BALLS

OF CHROME AND STAINLESS STEEL

Ready for your 1947 production schedules. Chrome and Stainless Steel precision balls of unexcelled quality.

For prompt delivery, telephone, telegraph or write, giving sizes required and application.

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UNIVERSAL BALL CO.

(A MODERN PRECISION BALL PLANT)

WILLOW GROVE, PA.

MONTGOMERY COUNTY

AN ANNOUNCEMENT of IMPORTANCE TO BUYERS of CUTTING OILS—

Houghton presents 4 new series of

CUT-MAX OILS

Highly fortified

Light in color

Easy to select

That Houghton is equipped by experience to develop cutting oils, is a fact admitted by the entire metal working industry, which has rated this company in impartial surveys as the leader in this field.

And that industry needs a simplification of cutting fluids, after the many diversified types resulting from pressure of war production, is likewise an admitted fact. There have been too many "specials," confusing the buyer who needed to reduce his inventories.

So the time has come to announce the results of a year of evaluation and development work within the Houghton organization. We have retained the best of many old-time favorites, regrouping them under new series numbers and including entirely new oil formulations to meet new needs. Thus we now offer four new series, described on the opposite page, and fortified by the latest developments in petroleum science and additive research.

These ready-to-use oils are supplemented by concentrated bases which may be diluted in the user's plant, and by water-soluble oils used for grinding and other machining needs.

So no matter what your needs may be for cooling, lubrication, drawing, stamping, quenching...rely on E. F. Houghton & Co. Plants in Philadelphia, Chicago, Cleveland, Detroit and San Francisco; service and sales offices in all principal cities.

HOUGHTON'S CUT-MAX CUTTING OILS ARE BACKED BY 80 YEARS OF METAL-WORKING EXPERIENCE

CUT-MAX 100 SERIES

High in saponifiable fatty oil content. Contain no sulphur or extreme-pressure additive. Primarily intended for use in machining non-ferrous metals, or where bearings of brass or bronze might be affected by the presence of sulphur or chlorine.

CUT-MAX 200 SERIES

Here is the heavy-duty group—fortified by added active sulphur (not merely the natural sulphur content of the oil itself) and by an extreme-pressure additive well blended into the cutting fluid. Thirty-four former products have been reduced to 13 by eliminating duplications and selecting time-proven leaders. Included are five oils identical in properties and varying only in viscosity, so that blends may be made to suit the needed fluidity without altering additive content or balance.

CUT-MAX 300 SERIES

This series is intended to fill a need for cutting fluids high in saponifiable content, specially sulphurized but free from chlorine so that bright machined surfaces will not stain or dull. A variety of viscosities is provided to cover a wide range of fluidities.

CUT-MAX 400 SERIES

This is a completely new development—light-colored, clear stocks mildly but effectively treated to reinforce nature's best petroleum stocks, and to offer an excellent money value for cost-conscious buyers. Whereas light-colored oils in the past have tended to lower cutting efficiency, the Cut-Max 400 Series include added sulphur (active—not inert) and E. P. additive, yet retain the clear appearance desired by many operators of automatics. This series will round out our line of fortified cutting oils for production machining.

A new folder describing the revised Cut-Max oils in these four series will be sent on request.

E. F. HOUGHTON & CO.

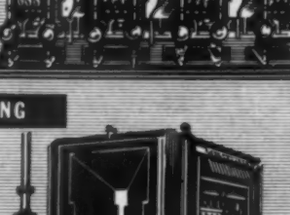
PHILADELPHIA AND ALL PRINCIPAL CITIES

New factor in management's big job of lowering production costs

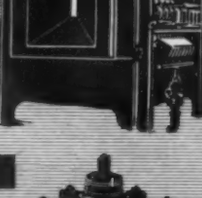
SELAS CORPORATION'S *Gradiation* PROCESS

BARS, TUBES, BILLETS

HEATING FOR FORGING

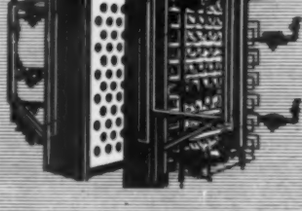


SELECTIVE HARDENING



STRIP HEATING

BRAZING



— provides metal industry new standards for heat-processing results

— distinguishes new techniques and equipment from traditional gas-heating methods

GRADIATION changes the ability of commercial gas fuels to serve industry. For speed, product improvement, exact reproduction of heating effects, automatic handling of work and ease of control, industry has new aid. Integration of heat-processes with plant operations is improved and, as direct result, substantial benefits in operating costs accrue.

Results are actual and can be measured. Engineers of Selas Corporation developed GRADIATION and then put it in use in plants and mills whose work with metals represents a cross-section of heating requirements. Installations and their results are the credentials with which GRADIATION—a distinct, new method—comes before industry.

Technically, the name GRADIATION implies *radiation*—high speed, high temperature, solar-like heat; it implies *gradient*—faster heating by exposing materials to superheat with precise control of heating rate; it implies *gas-radiation*—which protects the charge and is economical to apply.

Data from installations of the GRADIATION method are available to metal producing and metal working industries and to gas companies through Selas representatives or from Selas headquarters.

SELAS CORPORATION OF AMERICA PHILA 34 PA

GRADIATION IS A SELAS TRADE NAME

CONSULTING AND MANUFACTURING GAS ENGINEERS

LARGE GEARS
OF ALL TYPES

Our very modern equipment and facilities can regularly produce various gears up to 200" diameter. However, with special adapters and appliances, we can produce gears up to three times that diameter in bolted sections.

Continuous Tooth Herringbone Gears can be made by us up to 60" diameter, 18" face, and of any material.

Since 1892 we've made *nothing else but* gears and gear actuated products.

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Send for the famous "Gear Book" and use your Business Letterhead when writing.

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Industrial Gears and Speed Reducers
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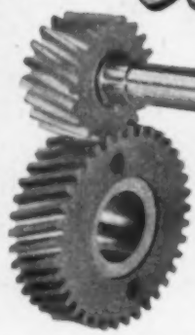
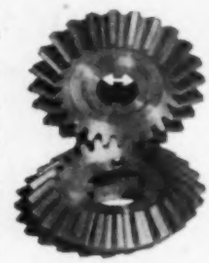
D.O.James GEARS For INDUSTRY



SINCE 1888 . . . We have been making many types and sizes of gears for industry. Vast plant facilities of the most modern gear cutting equipment assure capable handling of your *production* or *special* gear requirements.



HELICAL and BEVEL GEARS—From 1" to 60" in diameter and from 24 DP to 1½ DP.
SPUR GEARS—Size range from ¾" to 150" in diameter. 32 DP to ¾ DP.
HERRINGBONE GEARS—Made from 1" to 60" in diameter and from 10 DP to 1½ DP.
SPIRAL BEVEL GEARS—Made from 1" to 30" in diam. and 24 DP to 1½ DP.
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YOUR GEAR INQUIRIES WILL RECEIVE IMMEDIATE ATTENTION

D.O.JAMES MANUFACTURING COMPANY
1140 W. MONROE ST. • CHICAGO, ILL.

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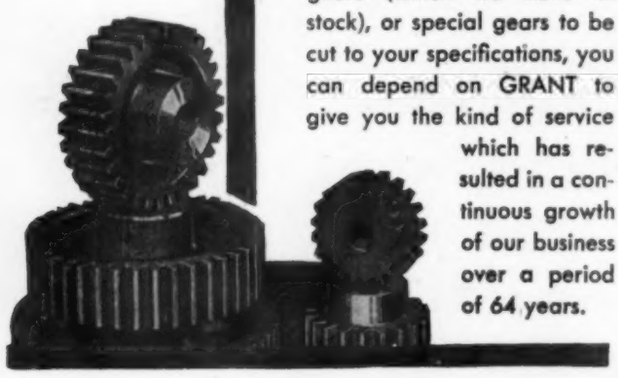
INDIVIDUAL ATTENTION

Whether your gear requirements involve standard cut-gears (which we have in stock), or special gears to be cut to your specifications, you can depend on GRANT to give you the kind of service which has resulted in a continuous growth of our business over a period of 64 years.



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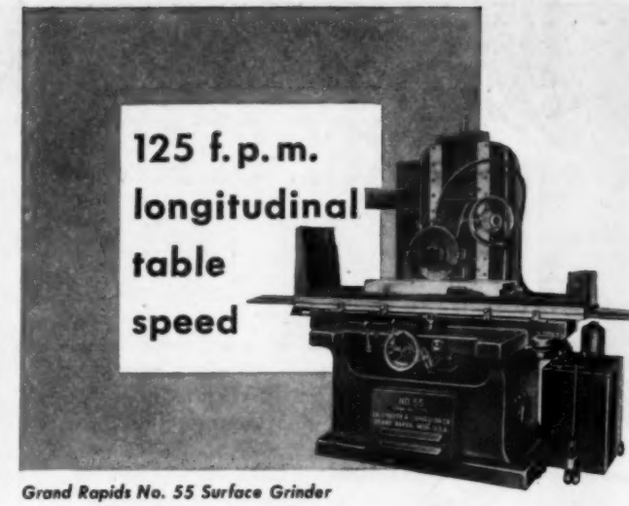

Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

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GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
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Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

Severance CARBIDE MIDGET MILLS

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C

¾ SIZE

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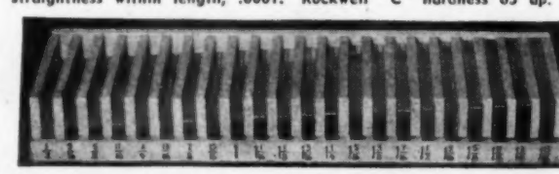
May be REGROUND time-after-time by Severance—savings are thus multiplied

SEVERANCE TOOL INDUSTRIES, INC.
726 Iowa Ave., Saginaw, Michigan

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS
ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.



Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

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GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
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GEAR CUTTING MACHINES

Well Designed
Good Features
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43 Years' Experience

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GEARS SPURS, SPROCKETS SPIRALS, BEVELS

Short or production runs guaranteed workmanship reasonable prices

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PREFERRED BY MOST!

- ★ SPUR
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- ★ HELICAL
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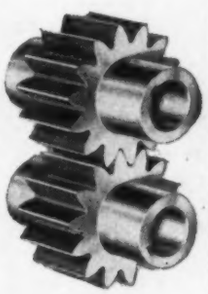
Faster assembly, better production, longer unit life demand gears with uniformity plus quality. The traditional dependability of Cincinnati Gears under the toughest of operating conditions is being emphasized as never before.

Bettered by every advantage that modern science and proven techniques can give, they are representative of that standard which for more than forty years has made ***"Gears . . . Good Gears Only"***, the first choice of industry.



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"Gears . . . Good Gears Only"
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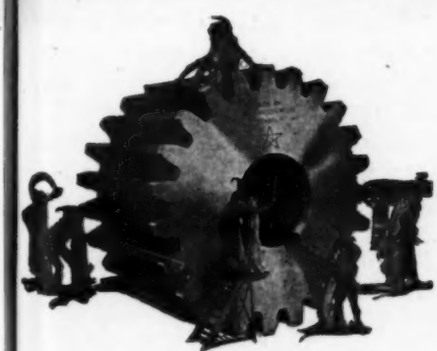

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CUT MEMBER OF AGMA **ALL GEARS TYPES**

Better Gear Products

GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.

Read what DI MACHINE *says about* FORMSPRAG

THE FULL COMPLEMENT *Over-Running Clutch*

DI MACHINE
Hi-Speed Automatic Punch Presses

2711 West Irving Park Road
CHICAGO 18, ILLINOIS

May 16, 1947

Formsprag Company
1415 Jarvis Street
Ferndale, Michigan

Gentlemen:

In an effort to increase the accuracy of the automatic feeding mechanism of the Diebel Hi-Speed Automatic Presses, our engineers have studied the many clutches available. You will be interested to learn that we have decided to employ the Formsprag Over-Running Clutch as a standard component of both our five and twelve ton punch presses.

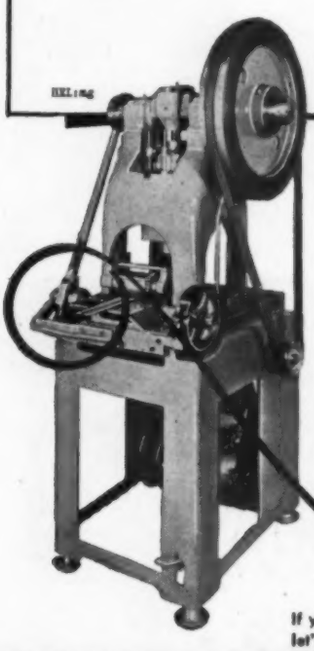
A roll feed, such as is a part of the Diebel Hi-Speed Automatic Presses, demands certain requirements of the clutch employed. First, the automatic roll feeding mechanism requires a highly accurate clutch. This is true especially if progressive dies are used in production. Second, backlash cannot be tolerated if accurate feeding is to be maintained. Third, because our five ton machine is adjustable up to 550 strokes per minute and our twelve ton machine up to 300 strokes per minute, the clutch must be capable of smooth and rapid operation.

Our decision to use your clutch was based on our conviction that the Formsprag Over-Running Clutch completely fulfills the exacting requirements created by our machines. We believe that your clutch assures the very greatest accuracy of feed, and backlash is eliminated. Furthermore, positive engagement and disengagement can be made hundreds of times per minute.

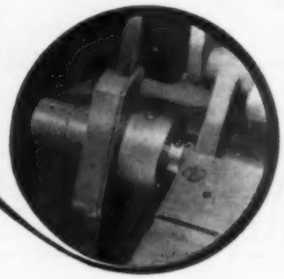
We are pleased to inform you that our opinion of your clutch has been substantiated by the efficient operation of the Diebel Hi-Speed Automatic Presses in actual production in the light stamping and forming field.

Very truly yours,
DI MACHINE CORPORATION
H. E. Larson
General Manager

HEL:ag



FORMSPRAG is *more* than an efficient, trouble free, overrunning clutch. It is a feature that makes sales for the products using it. It proves to your customers that you are giving them a better, more efficient product.



If you have or may have an application, let's talk it over.

FORMSPRAG *Company*
1415 JARVIS • FERNDALE, MICH.

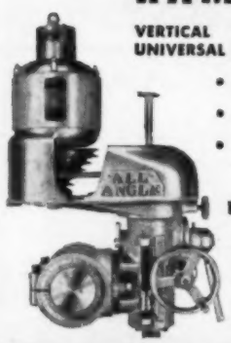
YOU DON'T HAVE TO STAND ON YOUR HEAD
. . . to do a difficult job on a FRAY Miller!

All-Angle

Fray

Precision
RAM TYPE NO. 7-B
VERTICAL UNIVERSAL **MILLING MACHINE**

- Flexible
- Sturdy
- Universal
- Easy to Operate
- One set up
- All angles quickly obtained



- Four sizes
- Four types
- Adaptable to all Milling Machines

For further information write Dept. A

WORLD DISTRIBUTORS
H. LEACH MACHINERY CO.
387 CHARLES ST., PROVIDENCE 4, RHODE ISLAND
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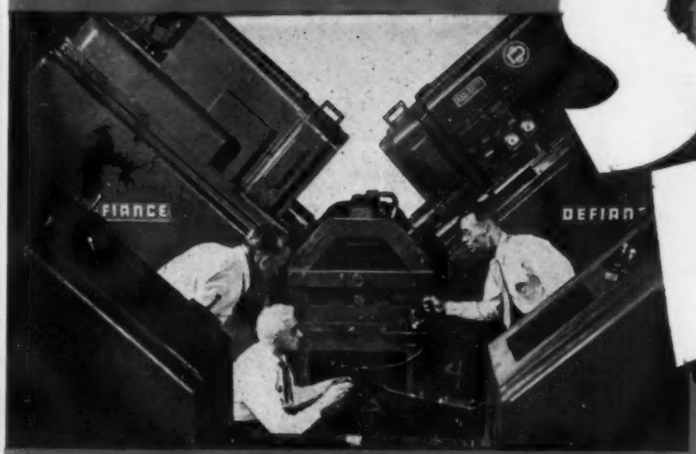
DEFIANCE MACHINES designed to help you

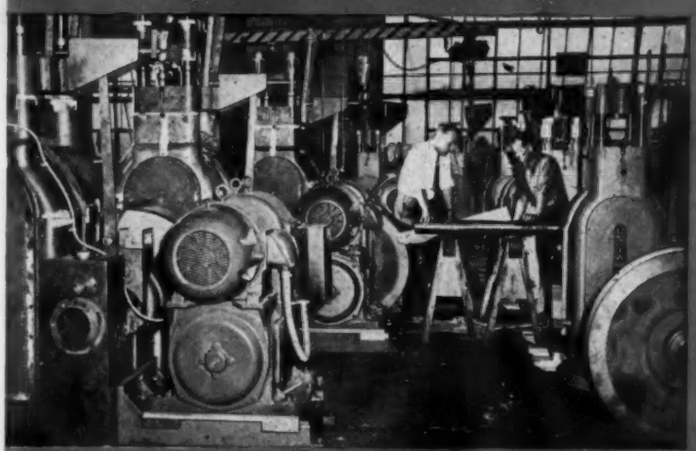
Save Labor!



Eight of these Defiance Machines in a series handle machining of valve holes and inserts in the manufacture of V-Type motors.

Faster production with Defiance Machines helps you *save labor* and *cut costs* . . . while maintaining close-tolerance *accuracy!* Also, there's less downtime because of Defiance dependability.

These are the finest heavy machines for boring, milling, drilling and tapping. Produced in a modernly equipped plant . . . where accuracy has been the watchword for 97 years. Now more than ever you need Defiance labor-saving Machines! Write concerning your requirements. Defiance Machine Works, Inc., Defiance, O.



Defiance-built preform presses for the plastics industry do the job *faster* —with less manpower. Shown here in assembly department at Defiance.

97 YEARS OF PRECISION MANUFACTURING

Modernly equipped plant at Defiance.

Defiance No. 25A Horizontal Boring Machine is designed with outboard bearing supports allowing maximum cross travel without sag. It has a 3¾" bar . . . 20 speeds range from 12 R.P.M. to 1000 R.P.M. . . . 30" x 60" table. Oversize construction insures rigidity.

DEFIANCE

BORING . . . MILLING . . . DRILLING TAPPING MACHINES

ON RED-E
BALL BEARING CENTERS

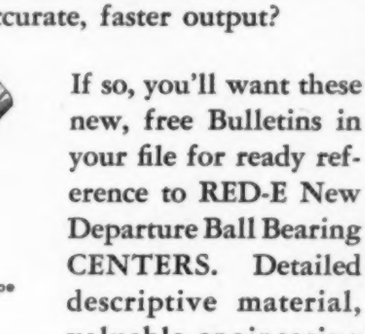
Working with carbide or high speed steel cutting tools? Need live centers that will stand up under continuous operation and maintain more accurate, faster output?

Shank Type

Ball and Roller Bearing Type

If so, you'll want these new, free Bulletins in your file for ready reference to RED-E New Departure Ball Bearing CENTERS. Detailed descriptive material, valuable engineering data . . . complete information to aid in selecting *precision* centers to meet your *precision* machining requirements.

Copies of Bulletins 471 and 472 will be mailed promptly on request. Write — Department AM.



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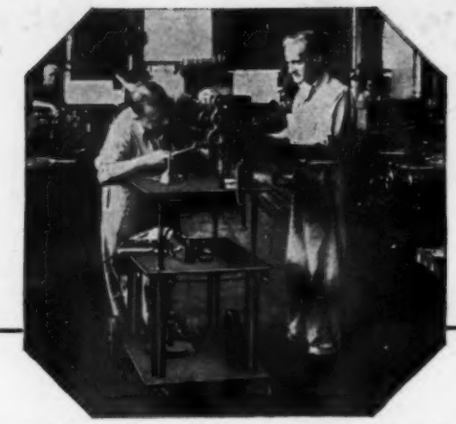

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MECHANICAL MUSCLE

Portelvator, the Hamilton Portable Elevating Table, forms a work bench when and where you need it. Saves the use of "extra hands" in moving and lifting heavy loads. Levels and supports overhanging work.

May be worked at from four sides. Three table surfaces. Four point support. Fast lift and slow lift mechanism. Positive floor lock.

Standard model capacities, 1,000 to 5,000 pounds. Special models built on order. Write for Bulletin P-47.

THE *Hamilton* TOOL COMPANY
SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
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Tolerances Worth Maintaining Are Worth Jo-Block Protection

When you set up dimensional inspection tolerances, it's to insure a specified class of fit in assembly, or to make sure of parts-interchangeability, or for some other good reason. The harder it is for a man to be *sure* he's staying within limits, *the more it costs.*

So, why not put a set of Ford Jo-Blocks on guard? Make it part of somebody's routine to check every working gage—whether snap-gage, micrometer caliper, dial indicator, plug-gage, ring-gage, or any other dimensional test device—with genuine Ford Jo-Blocks at definite, frequent intervals. Then, you'll *know* that everybody concerned is "speaking the same language" of measurement. Chances are that inspection will speed up and rejections at final inspection will be fewer.

Jo-Blocks are not expensive. They're made to three warranted accuracy standards—plus or minus .000002", .000004" and .000008". Sold throughout the Americas as single blocks or in varied sets (metric measurement, too). Extremely useful accessories available to expand and facilitate the use of Jo-Blocks. Write for illustrated literature. *Address:*

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NORTH CAROLINA
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Cleveland—Welding & Cutting Supply Co.
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SMITHway
A. C. WELDERS

Six models, including 3 new models of 150-, 200-, and 250-ampere capacity. Heavy-duty models: 300-, 400-, 500-ampere capacity. Write for specifications and prices.

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Even if your suppliers are thousands of miles away, and you need parts and supplies *right now* —let others do the worrying, but never you. Specify Air Express and get delivery in a matter of *hours.*

Air Express goes coast-to-coast overnight, and speeds up to five miles a minute insure same-day delivery between many U.S. towns and cities. Use it regularly, and you'll be paid off in greater customer satisfaction and smooth-running, efficient operation. To solve overseas shipping problems, investigate fast, frequent, inexpensive International Air Express.

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65 lbs. auto parts in Louisville had to get to Dallas fast. Picked up 5 PM on 25th, delivered to consignee 7 AM the 26th. 773 miles —Air Express charge $15.96! Other weights, any distance, similarly inexpensive and *fast!*

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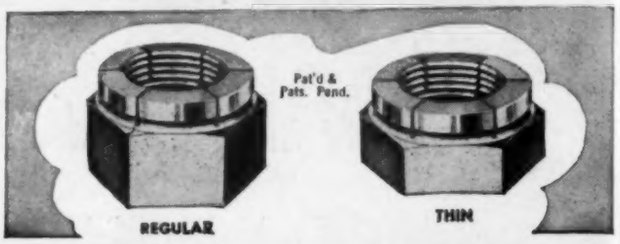

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SELF-LOCKING NUTS

"Flexloc" is of one-piece construction, available in U.S.S. and S.A.E. thread series and can be made in such metals as Steel, Stainless Steel, Brass, Bronze, etc. Every thread—including locking threads—takes its share of the load. "Flexloc" accommodates itself to a very wide range of thread tolerances . . . can be used over and over again without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . being a "stop" nut, it stays locked in any position on the threaded member.

It is made by the manufacturers of the unexcelled "Unbrako" Socket Screw Products—guaranteeing quality. Sizes from #6 to 1" in diameter,—in both "regular" and "thin" types (shown above).

Millions of Flexlocs now in use.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

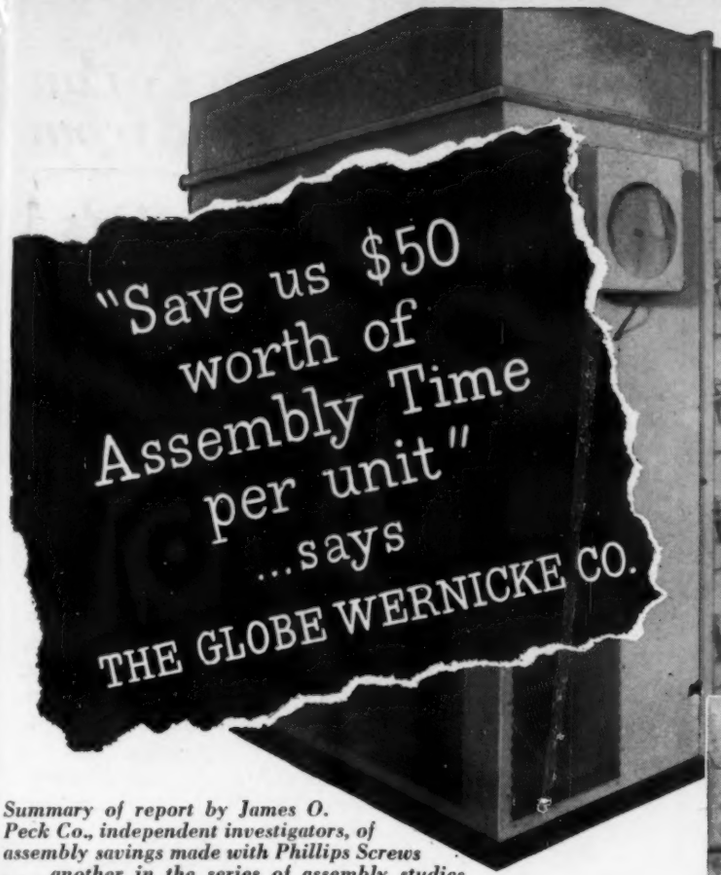
• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

MOLINE TOOL CO.

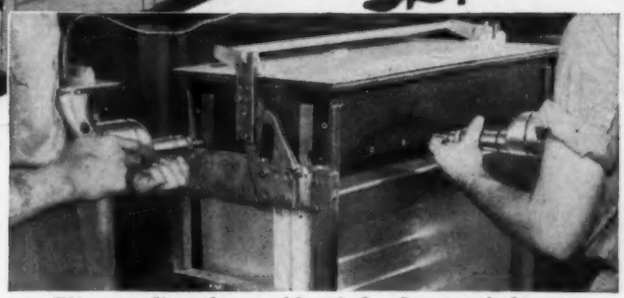
100 20th Street Moline, Illinois



"Save us $50 worth of Assembly Time per unit" ...says THE GLOBE WERNICKE CO.

Summary of report by James O. Peck Co., independent investigators, of assembly savings made with Phillips Screws . . . another in the series of assembly studies at prominent plants.

THE ICEBERG REFRIGERATED LOCKER COMPANY'S equipment for frozen food storage is made up in combinations of basic units like this 8-section (10 six-cubic-foot drawers to a section) locker.



The complicated assembly of the drawer of the ICEBERG REFRIGERATED LOCKER . . . made without driver skids to injure work or hands, thanks to Phillips Screws. Most of the thousands of Phillips Screws used in this assembly are Type "A", self-tapping, and are power driven up, down, and sideways.

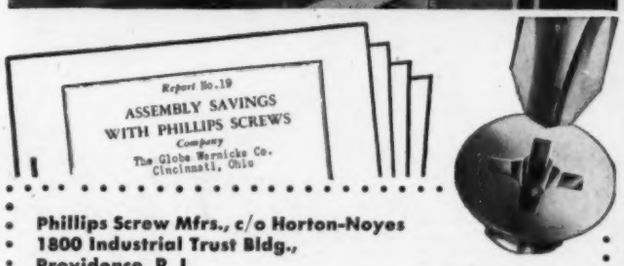
● "We manufacture these units for the Iceberg Refrigerated Locker Systems, Inc," explained the assembly head of The Globe Wernicke. "Our engineering department specified Phillips Screws throughout, and we're glad they did.

"Save us $50 worth of assembly time per unit. We can take full advantage of power drivers with Phillips Screws. No finder is needed and there's no fumbling such as we'd have with slotted screws. Since each unit requires thousands of screws, $50 is a conservative estimate of how much we save per unit by using Phillips Screws.

"Upside down or sideways . . . Makes no difference. Screws are driven with the unit in one position so that much of the driving is sideways or upside down. Difficult with slotted screws but very easy with Phillips Screws.

"No gouging or burring. Before we settled on Phillips, we tried out a lot of other type screws and found the driver would jump out and gouge the Masonite panels or burr the heads. Phillips Screws ended that, gave us better driving time with our power drivers."

Help yourself to money-saving ideas for your assembly operations. Write for the full report on The Globe Wernicke Co. and other assembly studies . . . covering metal, wood and plastic products. Use the coupon.



PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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24 SOURCES

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New England Screw Co.
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Send me reports on Assembly Savings with Phillips Screws.

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Company .....

Address ..... A.M. 20

FOR INSTALLATION in small space

KENT-OWENS
2-20 Hydraulic
Milling Machine . . . .

Here is a graphic illustration of the small space required for the installation of a Ruthman Gusher Coolant Pump. This P-3 1/10 Short Ruthman Gusher Pump requires no outside piping other than the hose and nozzle leading to the cutter. Both intake and delivery passages are self-contained. Full freedom of movement is assured for the operation of the metal working machine.

Designed to utilize minimum space of metal working machinery, Ruthman Gusher Coolant Pumps can be mounted wherever they will not interfere with efficient operation.

Write for Catalog 10-A

THE RUTHMAN MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

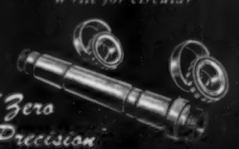
More Accuracy than most Big Lathes

New SHELDON
TRB-S56 Precision Lathes

There is a degree of accuracy built into the new $1000.00 Sheldon TRB-S56 Precision Lathe heretofore found only in a few of even the most costly lathes. For example, spindle bearings are "Zero Precision," the very finest, closest tolerance tapered roller bearing manufactured. The heavily struttted, 1-piece bed has 2 V-ways and 2-flat ways ground on special bed grinder and held to the closest tolerance of lateral and parallel alignment. The lead screws are milled on the most accurate special lead screw milling machine.

In the Sheldon TRB-S56 modern engineering, extensive tooling combined with the finest special machinery — a modern machine tool plant with modern equipment, modern manufacturing methods — give this small (11¼" swing, 1" collet capacity, 56" bed, 8 speed—50 to 1550 r.p.m.), convenient, moderate priced lathe, the permanent accuracy and features, heretofore found only in more cumbersome and costly lathes.

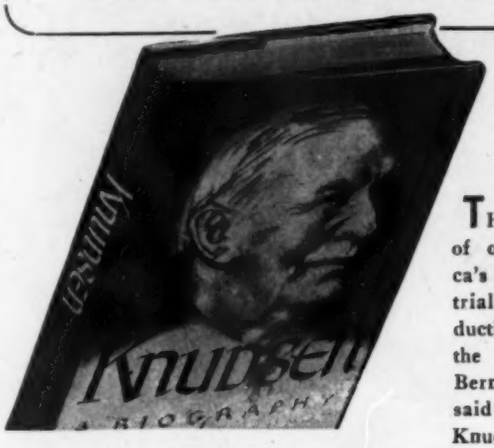
Write for circular



SHELDON MACHINE CO. Inc.
4234 NO. KNOX AVENUE, CHICAGO 41, ILL., U. S. A.

The fabulous career of an immigrant who rose from

—Mechanic to America's War Production Chief



THIS is the story of one of America's greatest industrialists and production geniuses, the man of whom Bernard Baruch said: "William J. Knudsen had a grasp of the productive potentialities of America equalled by few, if any. If that knowledge had been permitted to function, giving him full opportunity to use that knowledge, the war would have been shortened by many months, with the saving of many lives, untold suffering, and billions of dollars."

Just published!

KNUDSEN

A BIOGRAPHY

By NORMAN BEASLEY

Only $3.75

Beginning with Knudsen's arrival in America in 1900, this book traces his spectacular rise from bicycle mechanic to Henry Ford's production manager—from president of Chevrolet, and then of General Motors, to Director General of America's wartime Office of Production Management. Filled with the excitement and drama of the development of American big-business, and with the warmth and color of a remarkable personality, this biography is an inspiring saga of achievement in the true American tradition.

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"There is a world both of illumination and inspiration packed into this book." —*Columbus, O., Dispatch*

"Horatio Alger has never written a more fascinating success story than this bona fide biography of one of our greatest industrial leaders." —*Sunday Philadelphia Bulletin*

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Licensed under inventions of Guy Conner

Lempco's Pre-loaded Anti-Friction Guide Pin Bearings absolutely prevent any lateral motion between pins and bushings. As a result, they provide the following 6 advantages. Check them carefully. Each of them will play an important role in assuring the quality of your products and reducing costs.

1. **Perfect alignment of punches and dies.**
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3. **Die sets can be opened and closed by hand . . . saves up to 60% of die assembly time.**
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6. **Positively eliminates all lubrication problems.**

FREE: *Write for fully illustrated catalog, that is packed with factual evidence that proves all of the above advantages.*

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"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in **one** continuous motion, with **one** setting, using **one** *handle*. Produces clean, precise form without tool or chatter marks. Available in models C, E and F . . . also the Form Master, an accurate lower priced dresser. Send for folder.

***Fluidmotion* FEATURES**

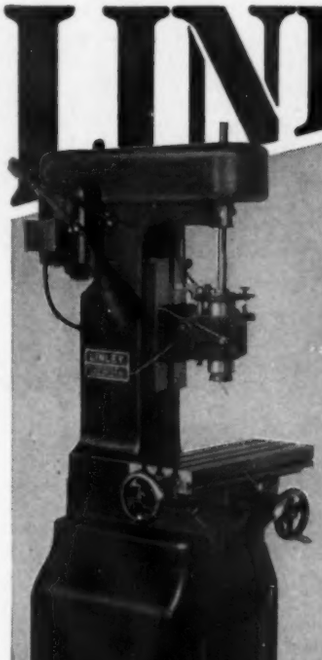
- *automatic centering*
- *.0001" accuracy*
- *one setting per form*
- *14" wheel capacity*
- *large radius range*
- *dustproof*
- *chatterless*

REG. U. S. PAT. OFF.

J&S TOOL CO.

479 Main Street, East Orange, N. J.

LINLEY



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Handles a wide variety of toolroom jobs with speed, accuracy, efficiency . . . die work, jig and model making, drilling, reaming, milling. Releases larger machines for work better suited to their capacities. Easy set-up, quick changeover . . . velvet-smooth feed, eight spindle speeds from 275 to 4250 rpm. . . simple, direct micrometer setting.

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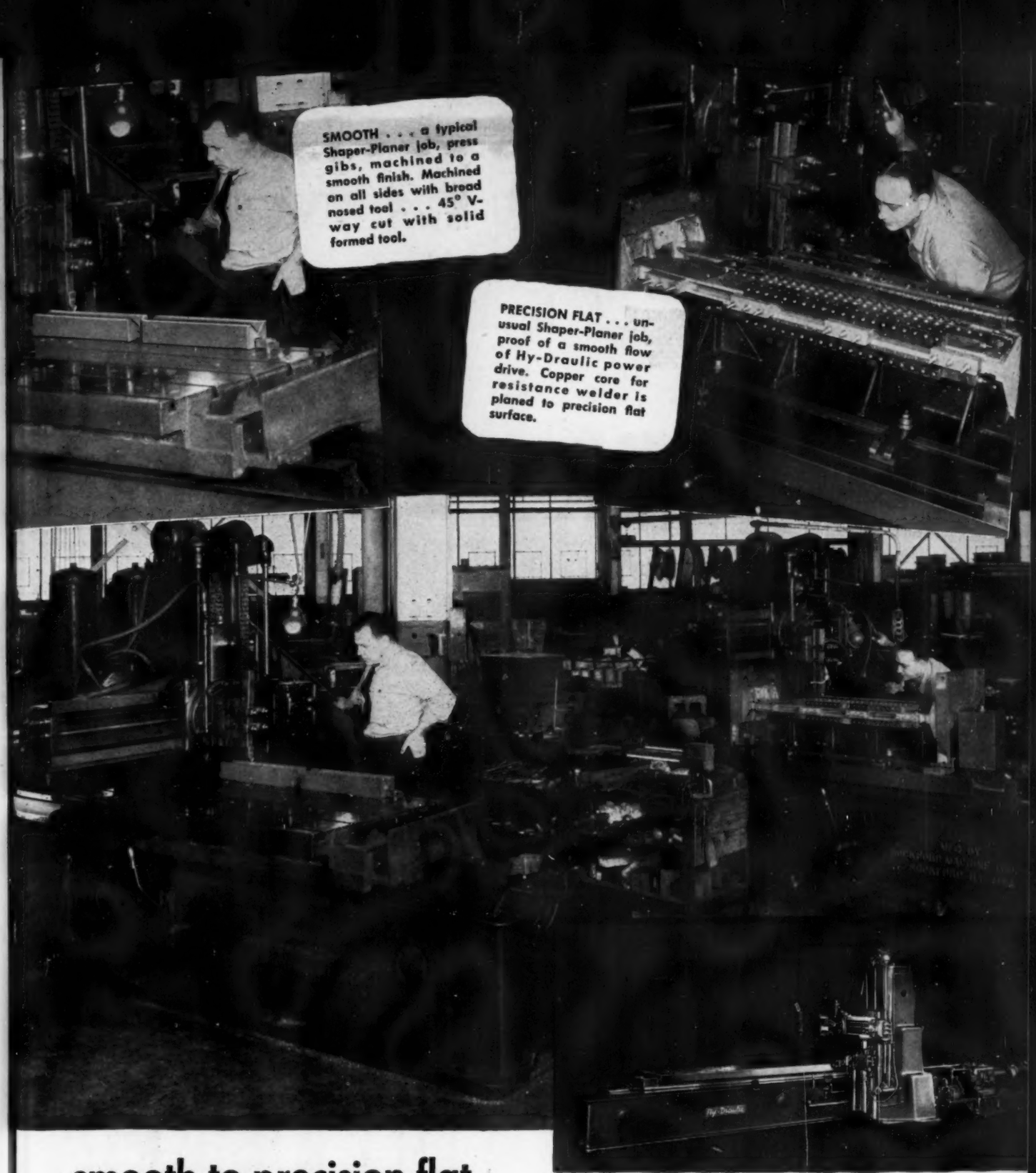
LINLEY BROTHERS CO., 664 STATE ST. EXTENSION BRIDGEPORT 1, CONNECTICUT


SMOOTH . . . a typical Shaper-Planer job, press gibs, machined to a smooth finish. Machined on all sides with bread nosed tool . . . 45° V-way cut with solid formed tool.
PRECISION FLAT . . . unusual Shaper-Planer job, proof of a smooth flow of Hy-Draulic power drive. Copper core for resistance welder is planed to precision flat surface.

smooth to precision flat

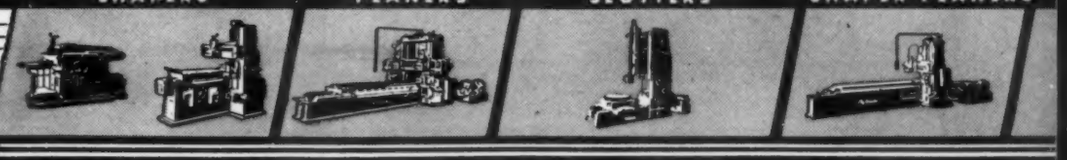
Unusual accuracy of the Rockford Hy-Draulic Shaper-Planer is demonstrated by the above installation. Machining the gibs to a smooth finish is a standard job, typical of the hundreds of small planer jobs that are easily and quickly done on a Shaper-Planer. But machining the copper core of a resistance welder is a most unusual job . . . and proof of the absolute smoothness of the Hy-Draulic cutting stroke. The finish obtained on this work with the Rockford Hy-Draulic Shaper-Planer was a surface that checked precision flat within a tolerance measured in micro-inches . . . the type of finish ordinarily obtained only by high speed carbide milling or by surface grinding. Rockford Hy-Draulic Shaper-Planers are always fast, always easy to set-up. In addition they give you the maximum in work accuracy that only quality machine construction plus the even flow of Hy-Draulic drive can provide. For complete facts write for Bulletin 445.

4712

1947 MACHINE TOOL SHOW CHICAGO SEPT 17-26

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

Hy-Draulic



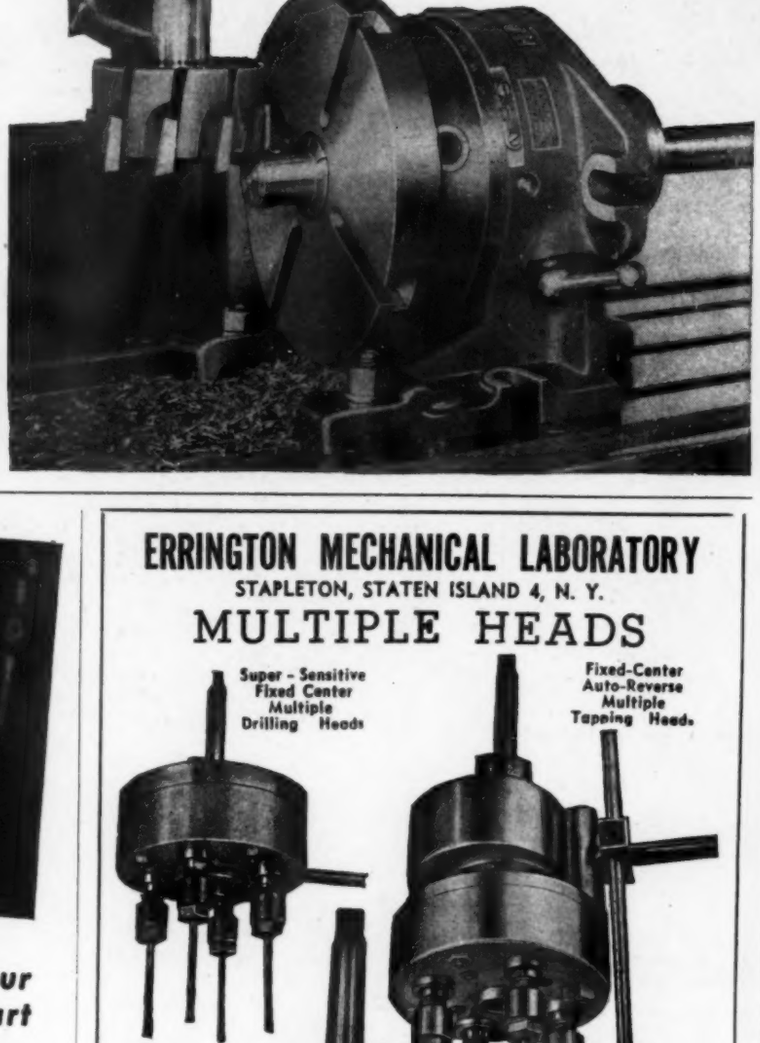
THE HARTFORD SUPER-SPACER

handles VERTICAL MILLING *with speed, ease and convenience*

This example of vertical milling shows the simple set-up of the SUPER-SPACER employing a face plate and a draw-in collet . . . a combination which assures fast, convenient milling of bar stock where indexing is involved.

There are many other applications of the Hartford Super-Spacer which have proved of outstanding convenience where unusual set-ups are required. Many of these applications are shown in literature available promptly on request and which should be of assistance to anyone interested in cutting production and tool room costs. It will pay you to investigate.

Write today for further details.



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Hartford 5, Conn.

If you want
MORE PARTS *per hour*
LOWER COST *per part*

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Write for bulletin 201 today

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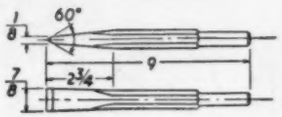
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

47 SIZES AND STYLES OF CLECO CHIPPERS

No. 3 WA Chipper with ratchet lock handle.



FLAT OR COLD CHISEL
Additional Lengths 12, 18, 24

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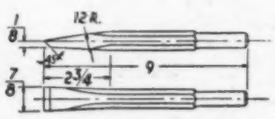
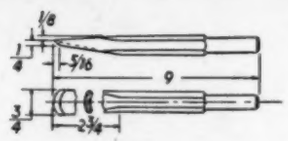
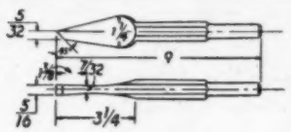


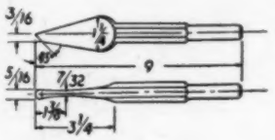
SIDE CUTTING CHISEL
Additional Lengths 12, 18, 24



GOUGE
Additional Lengths 12, 18, 24



CAPE CHISEL
Additional Lengths 12, 18, 24



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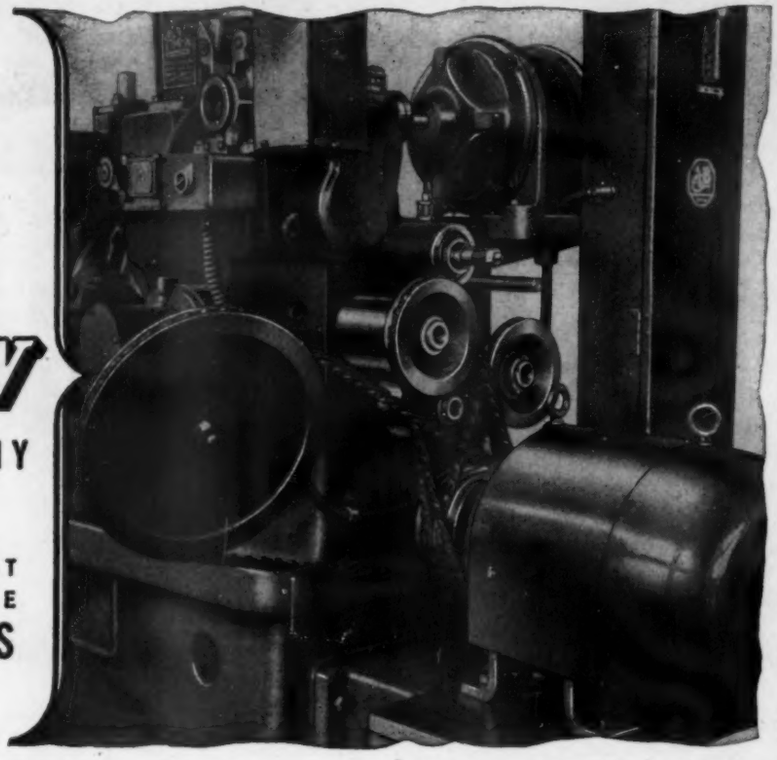

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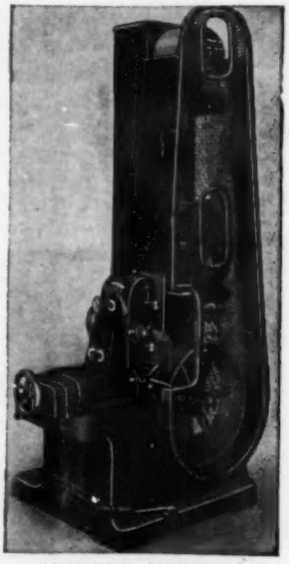

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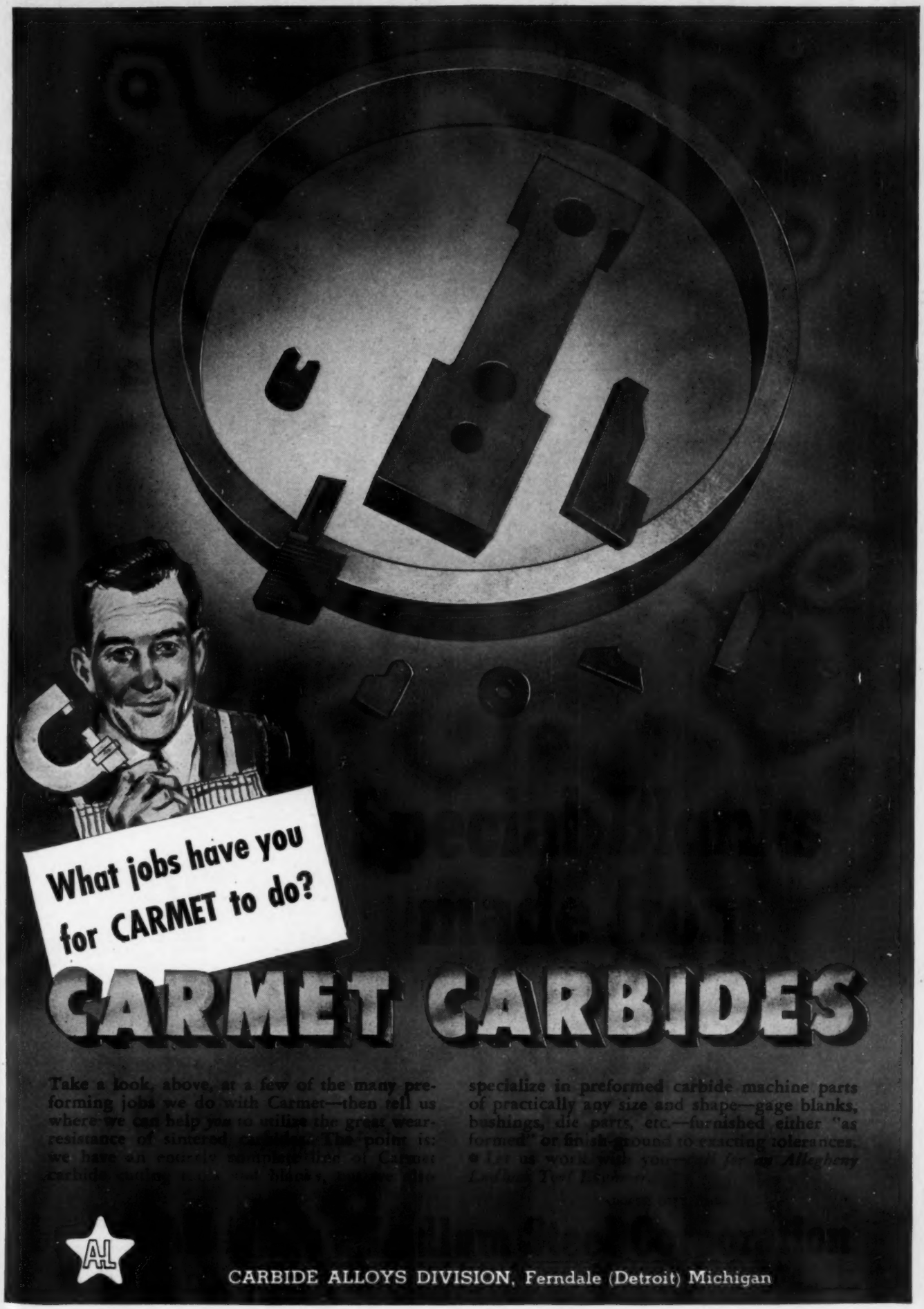
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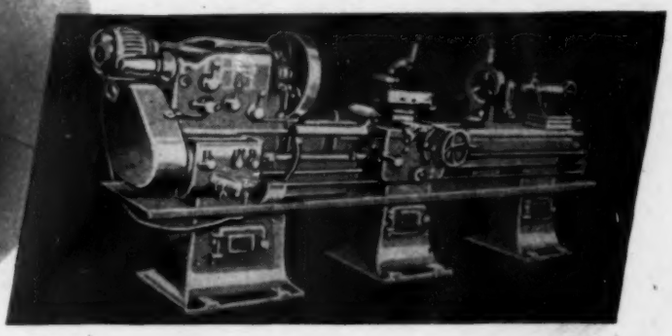

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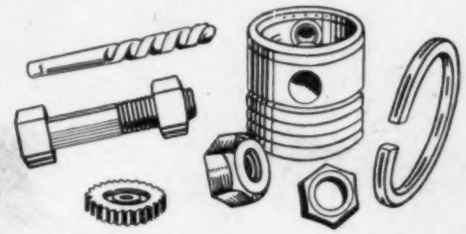

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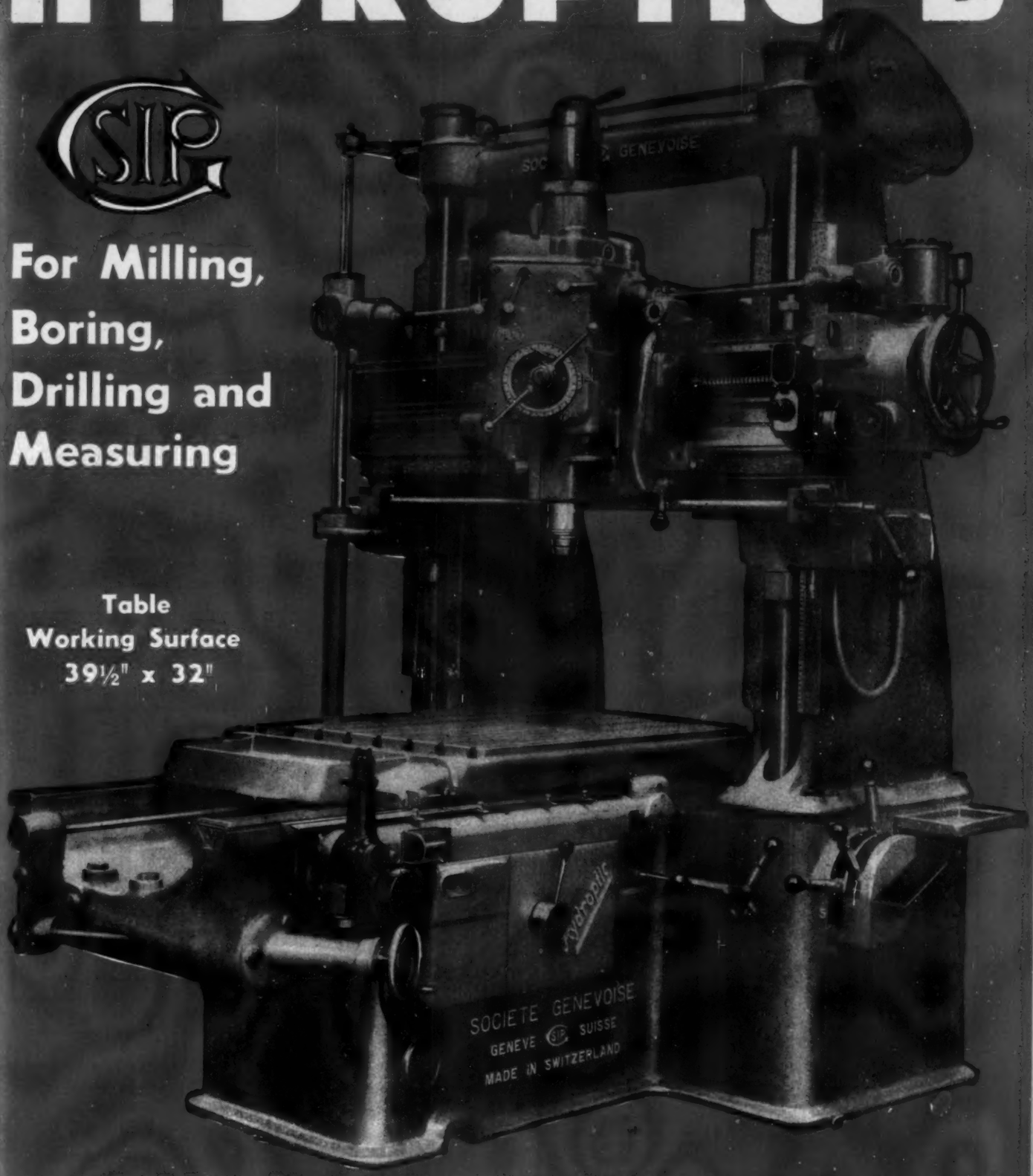
For Milling, Boring, Drilling and Measuring



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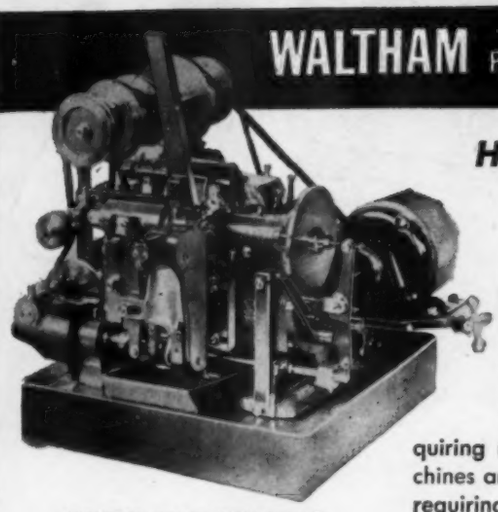

Highly productive—fast and accurate

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Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

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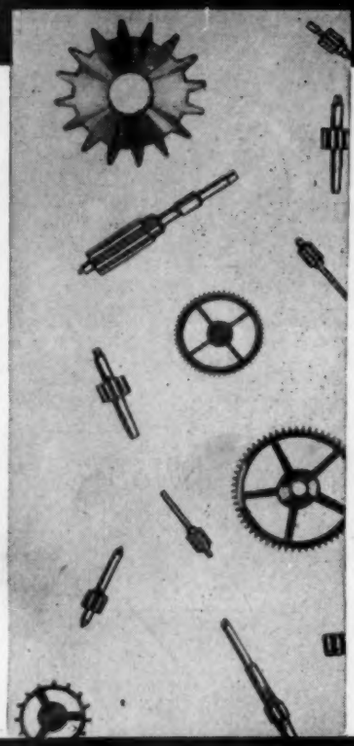

SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

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Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

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WALTHAM
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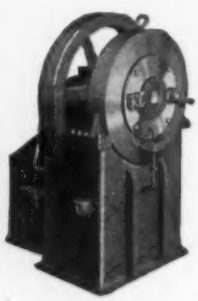

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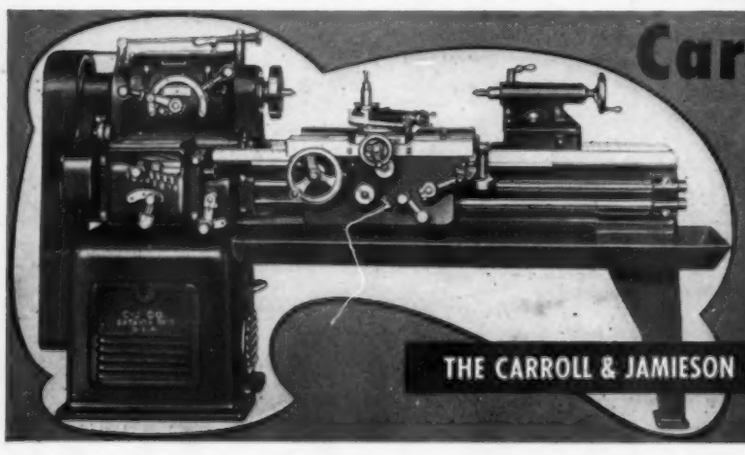

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12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions
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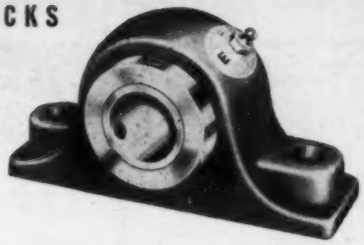

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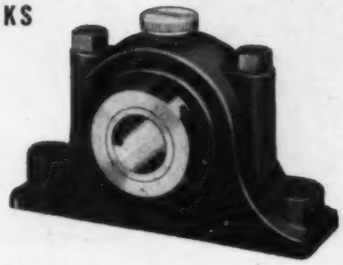

For general service. Normal radial, thrust and shock loads. 1-7/16" to 4-15/16".

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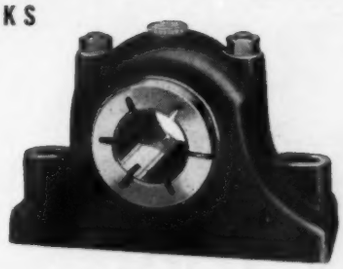

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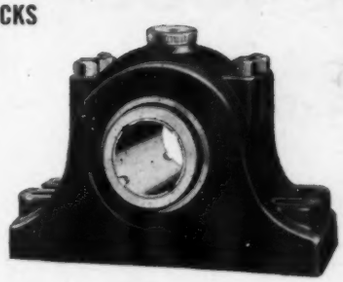

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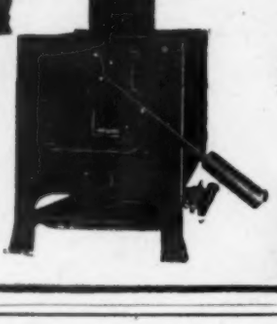

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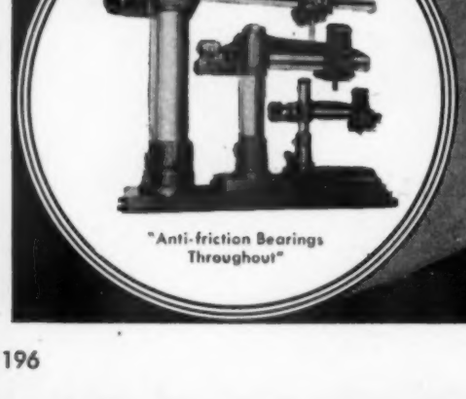

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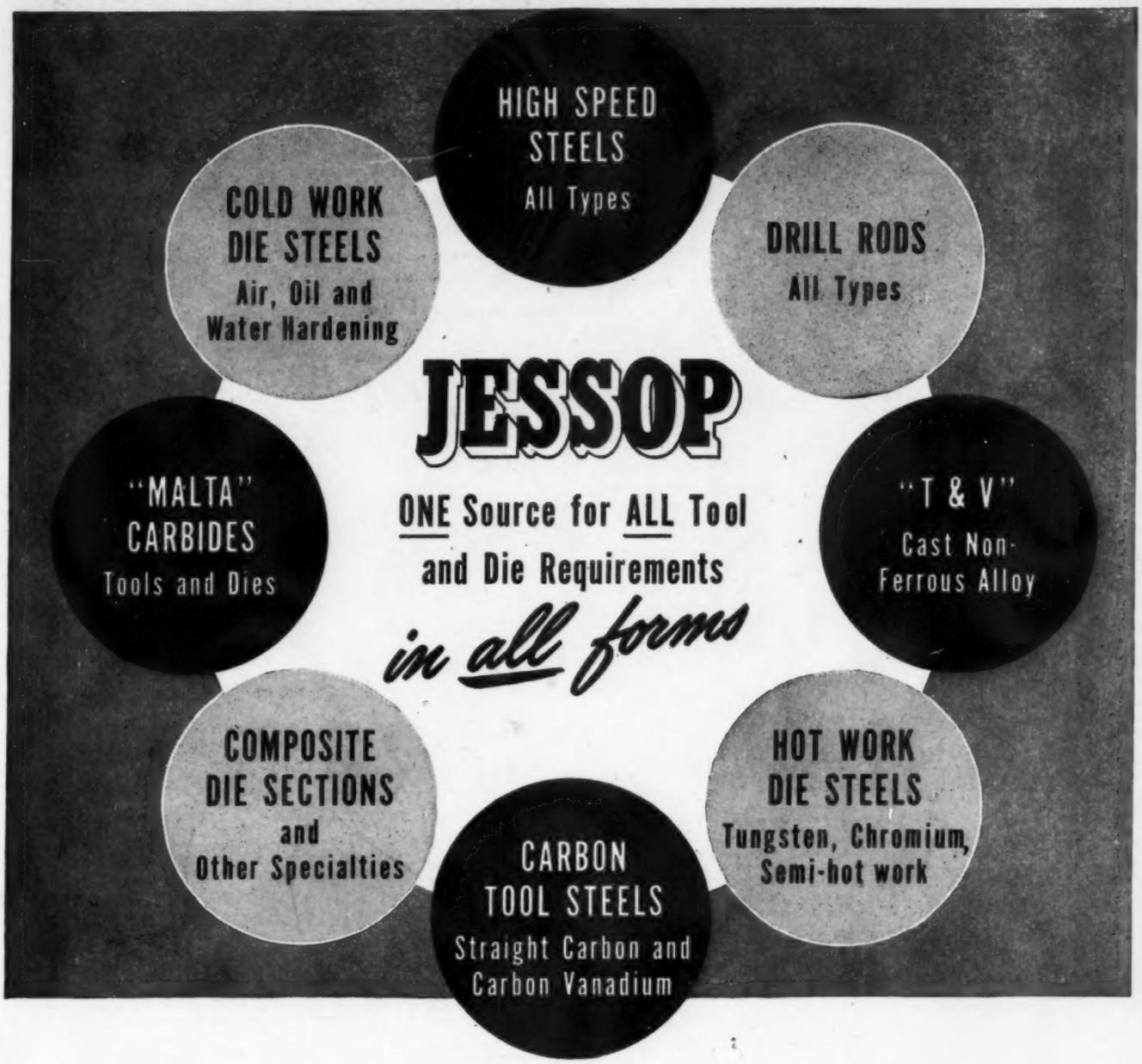

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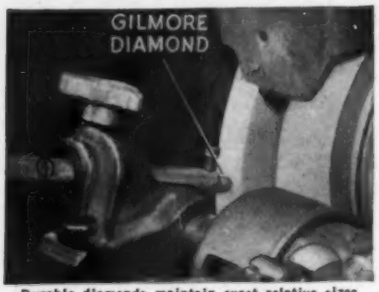

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A six-cornered diamond maintains a radius within close limits on the face of a formed wheel.

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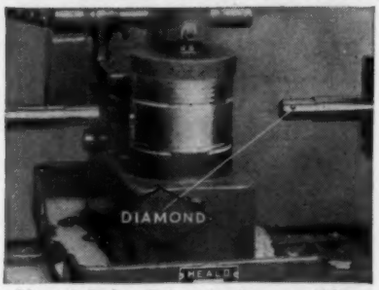
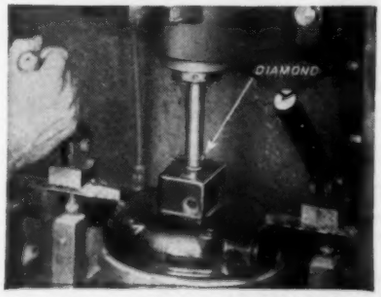
You are invited to call on our engineering staff for any information pertaining to the use of Diamond Tools for Grinding Wheel Truing, Turning, Boring or other industrial applications of diamonds.



Diamond Boring Tool performing a precision boring operation on wrist pin hole of piston.



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NICHOLSON EXPANDING MANDRELS

Set of 19 does the work of 209 solid arbors. No parts to wear out and cause distortion. Sure grip on heavy work. For all bores, 1" to 7". Two types, sold singly or in sets. Used in shops the nation over to save the time lost in making or looking for solid arbors. Bulletin 1043.

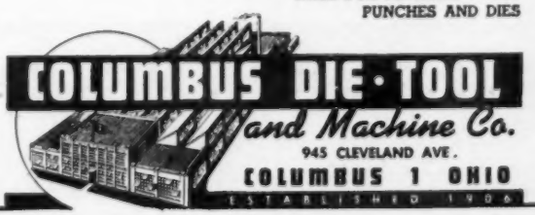
Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

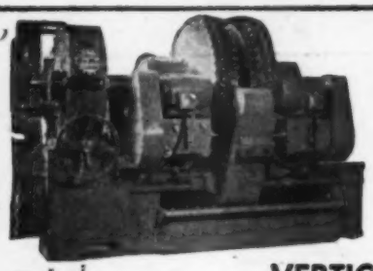
OUR TOOL DESIGNING saves you time and labor

Today when time is important, correct and efficient tool designing may make the difference between profit and loss. Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at a lower cost.

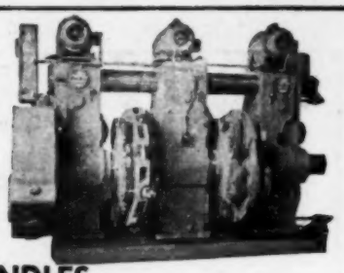
JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



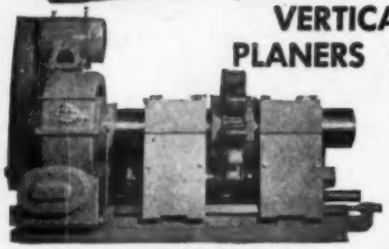
COLUMBUS DIE·TOOL and Machine Co.
945 CLEVELAND AVE.
COLUMBUS 1 OHIO
ESTABLISHED 1906



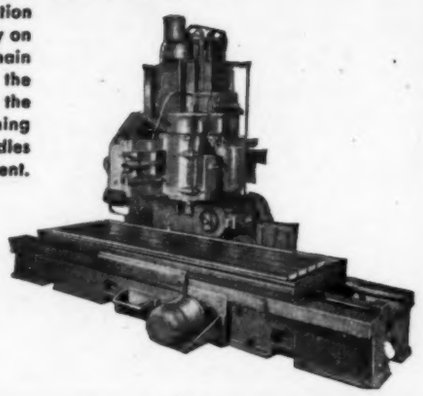
Roto-Matic MILLERS

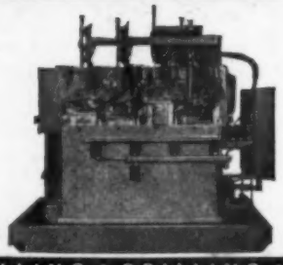


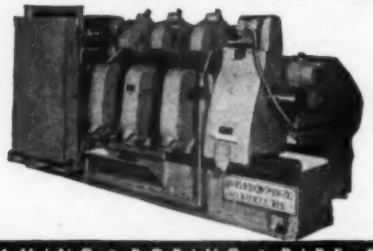
ROTARY DRUM TYPES •
VERTICALS • SINGLE AND MULTIPLE SPINDLES
PLANERS • RISE AND FALL • VERTICAL INDEXING



The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.



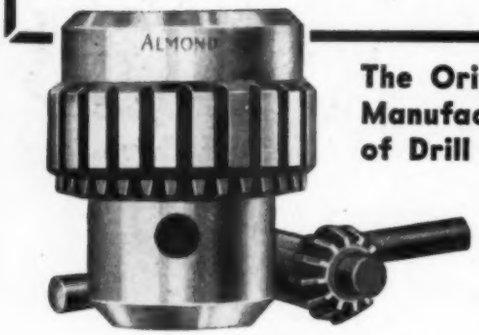




MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY
MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES
MILWAUKEE WISCONSIN

Almond Drill Chuck



The Original Manufacturers of Drill Chucks

. . . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

D. A. Stuart Oil CO.
2729 SOUTH TROY STREET, CHICAGO 23, ILL.

STUART *service goes with every barrel*

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

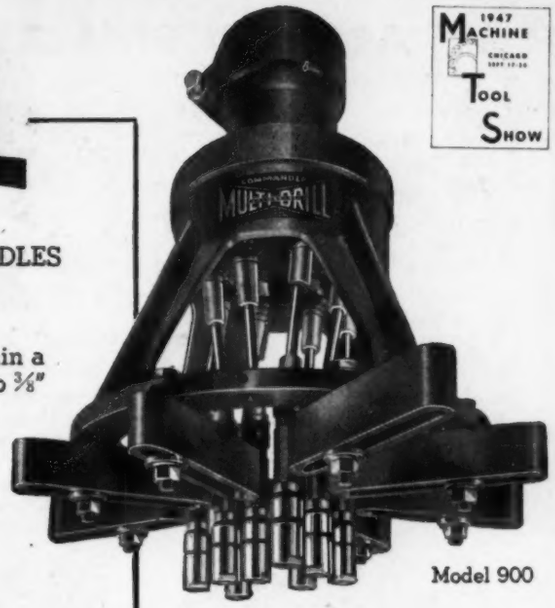
Adjustable MULTI-DRILL
for *Production* Drilling

1947 MACHINE TOOL SHOW CHICAGO

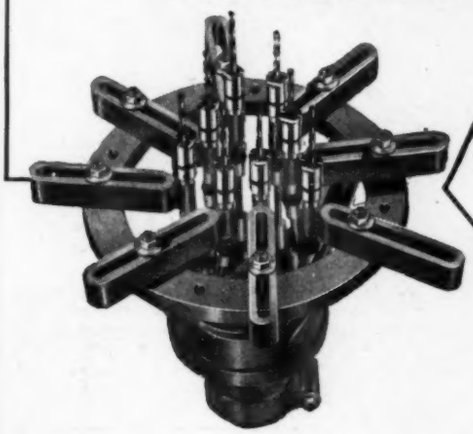
9" DRILLING AREA—AVAILABLE WITH 2 TO 8 SPINDLES

- Designed for accurate, high speed production drilling
- RUGGED CONSTRUCTION
- Quick, easy adjustments to **any** hole pattern on or within a 9" circle; ½" minimum center distances; Drill sizes ½" to ⅜"
- Special adaptations available

MULTI-DRILLS are made in other sizes and models
Write for details and name of your nearest Distributor



Model 900



Locater arms are designed for fast, easy adjustment.

FITS ANY DRILL PRESS
Dependable Performance .... proven by industry

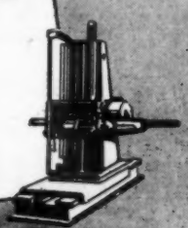
COMMANDER MFG. CO.
4229 W. Kinzie Street • Chicago 24, Illinois

Sensitive DRILLING MACHINES *Avey*
CINCINNATI OHIO

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co.
HUDSON, N. Y.

GILBERT

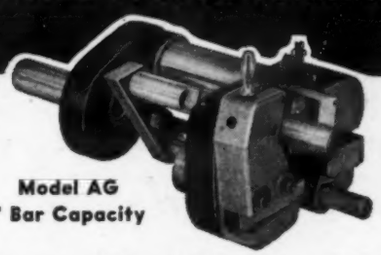
PRODUCTION SPEEDING
RADIAL DRILLS
AND
HORIZONTAL
DRILLING, BORING
AND MILLING
MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

CUT MACHINING TIME as much as 80% with the M.R.E. PROFILE TURNING BOX



Model AG
1" Bar Capacity

You save up to 80% machining time with the M. R. E. Profile Turning Box! This outstanding turning box turns profiles, multi-diameters and tapers at one pass. Can be used on capstans and automatic lathes. Available in 9/16", 1" and 1½" bar capacities. Widely used during war by such famous English firms as Hawker Aircraft, Rolls Royce, Vickers-Armstrong, etc. Inquiries invited from qualified dealers and sales agents.

Write to us today for information and illustrated literature. Address Dept. AM-7.

Machined at one pass by the M.R.E. Radius Turning Box. Made in 25 secs. from Dural with H.S.S. bit.

ACCREYLON COMPANY, INC.
130 West 42nd St., New York 18, N. Y.
Sole U. S. Agent
Mfd. by Manchester Repetition Engineers, Ltd. Manchester, England

ARE YOU STILL AN ACTIVE PARTNER . . . .

in this "7½ billion-a-year" success?

NEVER was there a partnership like the nation-wide brotherhood of volunteers who have helped sell, advertise, and promote sales of U. S. Savings Bonds! Their program is the greatest sales operation at the lowest cost in history.

Your continued support in promoting the Payroll Savings Plan will help "America's partnership" this year to repeat or surpass last year's four-star performance, in which sales of Savings Bonds were 7½ billion dollars—*exceeding redemptions by far more than a billion!*

So keep up the splendid work—keep on telling and selling your employees the advantages of Payroll Savings: (1) ease; (2) regularity; (3) safety of investment; (4) security for the individual and the nation; (5) $4 for every $3 at maturity! And, remember, people with a stake in the future are the most stable, most productive employees.

For any help you need in conducting the Plan, call on your State Director of the Treasury Department's Savings Bonds Division.

New Savings Bonds Plan won't affect the P.S.P.

THE Treasury Department and the banks of America are making it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

TWELVE HUNDRED HANDS TO FIND THE FACTS

FOUR hundred field correspondents ferret out, spade up, shoot in stories from all over the world of industry. Two hundred editors, bristling with Ph.D.'s and practical engineering and scientific knowledge, cull and correct and explain and expound. That's McGraw-Hill.

It *takes* a huge staff like this to keep abreast of events and developments in such a giant sphere as American industry. And the vote of thousands upon thousands of regular readers of McGraw-Hill publications seems to be: McGraw-Hill *has* what it takes to get the facts – fast.

To be well versed in the latest developments in *your industry*, be a cover-to-cover McGraw-Hill reader. Editors *and advertisers* collaborate to make your job easier. The advertising pages of all McGraw-Hill publications are packed with newsworthy information . . . the latest news on products and services that contribute to profits.

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Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

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Time for a

Spring Check-up . . .

on the plan that delivers Peace of Mind

THANKS to the work of patriotic volunteers, the U. S. Savings Bonds program has carried America a long way up the road to economic security.

During 1946, in spite of all the problems and uncertainties the nation faced, sales of Savings Bonds *exceeded redemptions* by $1,389,216,000. The success of this great sales operation has helped stem the tide of inflation, has reduced public debt holdings of the banking system, and has given millions of citizens a stake in their country and a profitable investment in their own futures.

Yes, we've come a long way—but the trip isn't over! Now is the time to check up on your Payroll Savings Plan. Make sure that all your new employees are familiar with its advantages. Remind *all* your employees that there's no easier, surer way to build their own futures—and America's—than by buying Bonds regularly through the Payroll Savings Plan. Every $3 invested pays $4 at maturity!

For any help you need in conducting the Payroll Plan, call on your State Director of the Treasury Department's Savings Bonds Division.

New Savings Bonds Plan won't affect the P.S.P.

SOON the Treasury Department and the banks of America will make it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

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CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

CONTRACT MACHINISTS MANUFACTURERS

Let us quote on the machining of your parts or complete assemblies.

Also

Metal fabricators—All types of welding, flame cutting, on a production basis. Your prints and specifications will receive prompt attention.

KOKOMO MACHINE CO.
120 WEST MONROE STREET
KOKOMO, INDIANA

Automatics — Semi-automatic

SCREW MACHINES *AVAILABLE*

Automatics up to 1¼" round bar stock. Semi-automatics ⅞". Large punch press and automatic threading machine. All facilities of well equipped machine shop. Send blue prints or samples for prompt quotations.

PARK SPRINKLER MFG. CO.
P.O. Box 6368, Zone 5
4031 Lenox Ave. Jacksonville, Fla.

CONTRACT

Machine Parts Manufacturing

Open Time on Latest Type Equipment:

- Production Automatic Milling Machines and Drill Presses
- Turret Lathes, 2¼" Bar Capacity
- Precision Cylindrical Grinding up to 12"x 36" (Including Internal and Taper)
- Spray Painting of Metal Parts
- Steel Heat Treating Facilities

Modern, fully equipped facilities for designing and building Special and Automatic Machinery, Metal Stamping Dies, Special Tools, Jigs & Fixtures. Large assembly floor space in modern steel and brick building.

Inquiries Invited

PHILIP H. BUEHRLE & SON, INC.

Plants	*Office*
SOUTH RIVER, N. J.	SPOTSWOOD
SPOTSWOOD, N. J.	NEW JERSEY

Established 1930

OPEN TIME FOR . . .

Plastic Molds, Forging Dies

Die Casting Dies, Tools, Gages

Stamping Dies

Extrusion Dies, Jigs, Fixtures

Formtools, Precision Machining

Model Making, Experimental Work

ZELF TOOL & DIE WORKS
682 6th Ave. N.Y.C. 10, GR 5-2355

Production and Assembly Facilities in Switzerland

Old established high class Swiss machine tool factory with modern plant facilities and technical skilled staff is interested in taking on any kind of high-grade American machines or machine tools for assembly and servicing or for production under license agreement.

Complete information and references available through its American representative.

CW-1306, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRECISION MACHINE WORK

Mold plates, Cavity plates, Rubber molds, Hydraulic pump units and parts to specifications. Die plates for injection molding. Strain rods. Production work, turret lathe, exceptional Engine lathe operations, Milling & Drilling. Machines built to specifications. Prints will receive prompt quotations.

MADISON MACHINE COMPANY
119 E. 22nd ST., PATERSON, N. J. LA 5-0638

SCREW MACHINE and TURRET LATHE PRODUCTS

Planer and Hor. Boring Mill Work. Castings Available. Gears, Sprockets, Jigs and Fixtures. Quick Delivery. Send B. P. For Quotations.

LEMBO MACHINE WORKS
154-158 East 23rd St., Paterson 4, N. J.

LARGE CHUCKING MACHINES (16" 8 spdl. Bullards, (5))

Fully tooled, ready to go! Latest design, with sufficient space for mfg. & assembling of allied parts in Detroit. Interested in renting or leasing to reputable concern, or, running on 50-50 investment basis.

CW-1375, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

SEND B.P. FOR MFG. COMPLETE ASSEMBLIES

Tool—Jigs—Dies
Screw Machine and Turret Lathe Work
Stampings—Gears

POSSY'S TOOL & MFG. CO.
51 Meadowbrook Buffalo 6, N. Y.

PURCHASING AGENTS

Farnham machines do the job! Aircraft war work gave us valuable experience in fabricating light metals, enabled us to design new machines for this work. Call on FARNHAM with your problem in special machinery.

FARNHAM
MANUFACTURING COMPANY
1646 SENECA ST. • BUFFALO 10, N. Y.

SCREW MACHINE PRODUCTS

Multi Spindle ¼" to 2⅝" Diameter. Punch Presses to 50 Ton. Turret and Engine Lathes. All secondary operations. Drill Press, Riveting, & Soldering, Packaging & Assembling.
Send us your prints or samples for quotations.

METOMIC CORP.
2944 W. 26th St., Chicago 23, Ill., Bishop 2133

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of American Machinist—about your facilities. Write for rates.

CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

SCREW MACHINE PRODUCTS

To Your Requirements, Capacity 2⅝" Diameter. Production Milling & Drilling

J. W. BRINSER & SONS
317 GILPIN ROAD WILLOW GROVE, PA.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATES

(Not available for equipment advertising)

60¢ per line, minimum 4 lines. To figure advance payment count 6 average words as a line.
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 50 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A.M. July 29th will appear in the issue of August 14th subject to limitation of space available

WANTED
ENGINEER or DESIGNER

We want a mechanical designer or engineer who has had direct experience in the production of carpenters tools, particularly bit braces, spiral screw drivers, hand drills, etc. Must be a competent draftsman with sufficient shop background and inventive ability to design and integrate all production tooling and products. Small company with excellent future prospects located southern Connecticut. Salary open.

P-1346, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

OLD ESTABLISHED company manufacturing a major automobile part which is sold directly to vehicle manufacturers has opening for experienced machine maintenance foreman. Plant located in Central Indiana employing 600 men. All types of machining operations, heat treating and grinding. Modern equipment, automatics bar and chucker, hydraulic operated machines, precision finishing, etc. Good connection for reliable man. Present foreman retiring after 25 years. State age, experience, salary expected, etc. All communications will be treated in strictest confidence. P-1017, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: CHIEF tool and die engineer. Manufacturer of bus bodies and custom auto bodies. Employing approximately 1100 people requires the services of a qualified tool and die engineer to take complete charge of tool and die engineering and construction of same. Must be experienced in passenger car or bus body tooling, also experience helpful in tooling for plane manufacture. This is a permanent position with a reliable old company. Future for man with proper experience and who can accept responsibility, supervise personnel, and carry complete tooling program. State past ten years of employment giving names of such employers and salary desired. All communications will be held confidential. Address, P-1363, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

GRADUATE MECHANICAL engineer to learn ball and roller bearing sales engineering for territory in upper New York state and New England states. Write, P-1299, American Machinist, 330, W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEER for ball and roller bearing engineering and sales work in upper New York. Write, P-1296, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER—ASSISTANT to plant engineer. Experienced in plant layout and maintenance of building and metal fabricating equipment. Progressive company. Write, Personnel Director, Hussmann-Ligonier Co., 2401 North Leffingwell Avenue, St. Louis 6, Mo.

DESIGN ENGINEER familiar with farm implements, capable of initiating and carrying through to completion designs for disc plows and other tillage implements. Beginning salary $425.00 per month. Steady advancement for satisfactory work. Krause Plow Corporation, Hutchinson, Kansas.

SALESMAN WANTED

TOOL ENGINEER and salesman wanted for Eastern territory. Salary and commission full résumé first letter. SW-1143, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED
REPRESENTATIVES AND DEALERS

To handle nationally advertised new holding tool. No competition. Attractive prices and discounts. Good commissions. Immediate delivery. Territories open. Write for particulars.

RW-1377, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 443 Delaware Ave., Buffalo 2, N. Y.

POSITIONS WANTED

GEAR SPECIALIST—12 years' experience with gear hobbers and threadmillers, who is capable of analyzing and correcting gear, tooling, and machine troubles desires position with gear manufacturer. Experienced in spline, spur, helical, and worm gearing; milling worms, threads, and leadscrews. PW-966, American Machininst, 520 N. Michigan Ave., Chicago 11, Ill.

YOUNG MAN—Age 18—technical education has 2 years' toolroom experience, wants to learn tool and diemaking or design. Can supply references. What have you? PW-1150, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUCCESSFUL SALES engineer with 15 years experience selling Machine Tools. Excellent engineering and manufacturing background. Severing present position as Sales Manager. Location open, now residing Los Angeles. PW-1342, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Outstanding Manufacturing Management Executive

Competent seasoned mechanical engineer, seeking a permanent connection with a live progressive organization.

Varied experience includes thorough knowledge and capacity for materials management, maintenance, mass precision production and jobbing work, process planning, tool design, tool making, plant layout, assembly operations, forge shop, stamping and press room, grey iron and malleable foundries.

Details and references furnished on request to responsible parties stating their requirements. Address reply to

PW-1088, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER

5 years' experience in Machine Tool Design and small mechanisms. 26 years of age. Form. empl. with H. D. Murray Ltd., London, Jardine Eng. Corp., Shanghai.

PW-1338, AMERICAN MACHINIST
330 W. 42 ST., NEW YORK 18, N. Y.

POSITIONS WANTED

DESIGN ENGINEER—with 20 years' experience in the design and development of machine tools and single purpose, multiple station, special machinery for automotive and general industrial production desires connection with well established company. Availability approx. 30 days. PW-1228, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CONSULTING ENGINEER manufacturing procedures and methods. Excellent record of accomplishment in the design and development of products and the adaptation production facilities. Can organize and follow-up work to have it completed in a satisfactory and economical manner. PW-1372, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

NEW ENGLAND sales representative wants additional line—selling for over twelve years to established clientele of manufacturers—specializing in production parts, small components, bearings, etc.—on commission basis—references exchanged if desired. P. O. Box 838, Springfield, Mass.

PATENT ATTORNEY

Patent and Trade-Mark Practice

before U. S. Patent Office Validity and Infringement Investigations and Opinions Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

MANUFACTURER'S REPRESENTATIVE in INDIA — BURMA

Well established representative desirous of contacting leading American manufacturer interested in representation and distribution in India and Burma. Excellent bank references.

P. K. PATEL & CO.
P. O. BOX 88, BARODA (INDIA) CABLES PIKE

MANUFACTURING OPPORTUNITY

Vertical Milling Head, Patent No. 2,385,735 with working model, patterns and tracings for sale. Cash or part royalty.

CHARLES E. SKELTON, *Machine Designer*
116 South Salina Street, Syracuse 2, N. Y.

MACHINE TOOLS
FOR RENT FOR YOUR OWN USE

On our premises at low hourly rates.

New Bridgeport Vertical Millers

Small Planer, Surface Grinder

Engraver, Lathes, Drill Presses etc.

ZELF TOOL & DIE WORKS
682 6th Ave., N.Y.C. 10, GR 5-2355

WANTED ADVERTISING ON PAGE 214

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

LATHES

10"x24" Logan Q.C.G. Lathes (new)
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
16"x6' Lodge & Shipley Geared Head, M.D.
16"x8' Monarch Geared Head Lathe
18"x10' American, Geared Head, Taper
18"x6' American Q.C.G. motor drive
20"x10" American Q.C.G. motor drive
20"x11' Schumacher-Boye, M.D.
24"x10' LeBlond Quick Change Gear
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head
20"x8' Lodge & Shipley, motor drive
24"x22' Lodge & Shipley, G.H.M. drive
24"x36' New Haven, M.D.

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

MULTIPLE DRILLS

Natco #12 Arranged for 20 spindles
Natco #D6, 24 spindles, M.D. late type
Natco #D5, 14 spindles, M.D. late type
Fox #15, 54 spindles, M.D.

GRINDERS

Blanchard #16 Vertical Rotary Surface Grinder, motor drive
Pratt & Whitney 14" x 36" Vert. Surface Grinder, motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

FOUNDRY MACHINES

2—#0 Johnson & Jennings, Jolt Squeezer Draw Pattern, 15"x21" Table
2—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23x38" Table
2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"
1—#602 Osborn Jolt Rollover and Pattern Draw, jolt cap. 900#, 36" flask length.
1—Tessmer, Sprue Cutter, 1¼" square, capacity

SHEARS & METAL WORKING

Lennox Splitting Shear, ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 8 Rolls
Niagara Ring & Circle Shear 20 ga.
Niagara Foot Squaring Shears, 30"

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1 Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller, M.D.
Hanson & Whitney 10"x24" Thread Miller
Pratt & Whitney 6"x24" Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

BORING MILL

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #3

RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm, 11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford

SHAPERS — PLANERS

Fellows No. 6—36" Gear Shaper, motor dr.
24" American H.D., B.G., Crank Shaper, Direct M.D.
20x20x36 N.B.P. Shaper Planer
Whitcombe 24"x24"x6' Planer
1—New Haven, 12" Slotter (like new)
Gray 26"x26"x8' Planer
Betts 120" x 72" x 35' Metal working Double Housing Planer. Equipped with: 4 heads and power rapid traverse. With motor drive and controls, bed is 61' 3½" long

Pratt & Whitney 0" to 6" Vertical Shaper, swivel head on ram, rotary table—20" diam. Recently overhauled. Very good condition. Motor driven.

POWER PRESSES

2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
Bliss 68-C Double Action, three Crank Press.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. AAR, motor drive, 48" throat
Bliss #4¾ Dble. Crank Press, 5" shaft, 4" stroke
Bliss #76½B Single Crank Geared Press, 7" shaft, 3" stroke
Horton-Ackerly, Back Flywheel Bench Presses, ¾" & 1" stroke
Caldwell, 200 tons capacity, Hydraulic Horizontal Wheel Press
Lucas 15 ton Power Arbor Press
Bliss-Consolidated #163B S.S. Dble. Crank Press
Baxendale #4 O.B.I. Power Press, 2½" stroke

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Machinery Merchants

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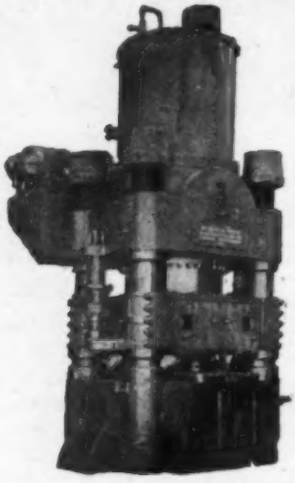

H.P.M. 2000 ton fast traverse, HYDRAULIC PRESS. Bed 46½" x 67½". Stroke 12". Shut height 20¾" with pumps, motor, and controls.

No. 45 GIDDINGS & LEWIS, table type, BORING MILL, 5" Bar.

84" GISHOLT VERTICAL BORING MILL.

72" x 64" x 14' INGERSOLL PLANER TYPE MILLING MACHINE with 2 Vertical heads (1 head right angle) and 1 side head.

No. 5 REED-PRENTICE VERTICAL JIG MILLING MACHINE, table 68"x 16", motor drive

10" x 168"
PRATT & WHITNEY THREAD MILL

54"x18' HOUSTON STANWOOD GAMBLE Heavy Duty ENGINE LATHE with motor.

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EMERMAN MACHINERY CORP.
875 W. 120th STREET **CHICAGO 43, ILLINOIS**

LOOK! ALL LATEST TYPE!

READY TO GO!

30"x60" Monarch model NN Lathe, taper, 1944
#25A, 3¾" Defiance Horizontal Boring Mill, 1941
14"x60" Pratt & Whitney Hydraulic Vertical Surface Grinder, 1942
30—#2 Kent 6"x19" surface grinders, 1943
12"x36" Norton Multipurpose Universal Grinder, 1941
#11 Blanchard 16" Rotary Surface Grinder, 1941
#91A Covel Universal Tool & Cutter Grinder, 1942
24" Gemco Universal Shaper, PRT 1947
16" Cincinnati Universal Shaper, 1942
12" Smith & Mills Toolroom Shaper, 14" stroke, B.G. 1943
#2G Kempsmith Plain Miller, 1943
10"x10" Peerless Universal Shaping Saw, 1942
7"x7" Peerless Hydra-Cut Saw, 1942
2—8" Ames Precision Collet Lathes, 1942
150 ton Rodgers Vertical Hydraulic Shop Press, 1946

THE O'BRIEN MACHINERY CO.
113 N. 3rd ST. **MArket 7-4180** **PHILA. 6, PA.**

LATE TYPE TOOLS

#2MH Cinci. Univ. Miller 1944
#3SP Van Norman Miller 1942
Nos. 2, 3, 4, Cinci. Vert. Miller '42, '45
#2, 3, 4 & 5 W. & S. Univ. &
#3 J. & L. Univ. Turret Lathes
#712 Fellows Gear Generator, 1942
36H & 48H G.&E. Gear Hobbers
30" x 15' centers Amer. Super Pro. Lathe
18" raised to 24½" x 192" centers, BB Model Monarch, Carr. P. R. T., '42

BENNETT MACHINERY CO.
30 Church St. **N. Y. 7, N. Y.**

LATE MODEL TURRET LATHES

3—#0 B & S Wire Feed Screw Machines, M.D.
14—#3 W & S Ram Type Univ., M.D.
1—#4 W & S Ram Type Univ., M.D.
3—#3 J & L Ram Type Univ., M.D.
1—#5 J & L Ram Type Univ., M.D.
3—#1A W & S Saddle Type Univ., M.D.
1—#2A W & S Saddle Type Univ., M.D.

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200 Bent St. **Cambridge 41, Mass.**

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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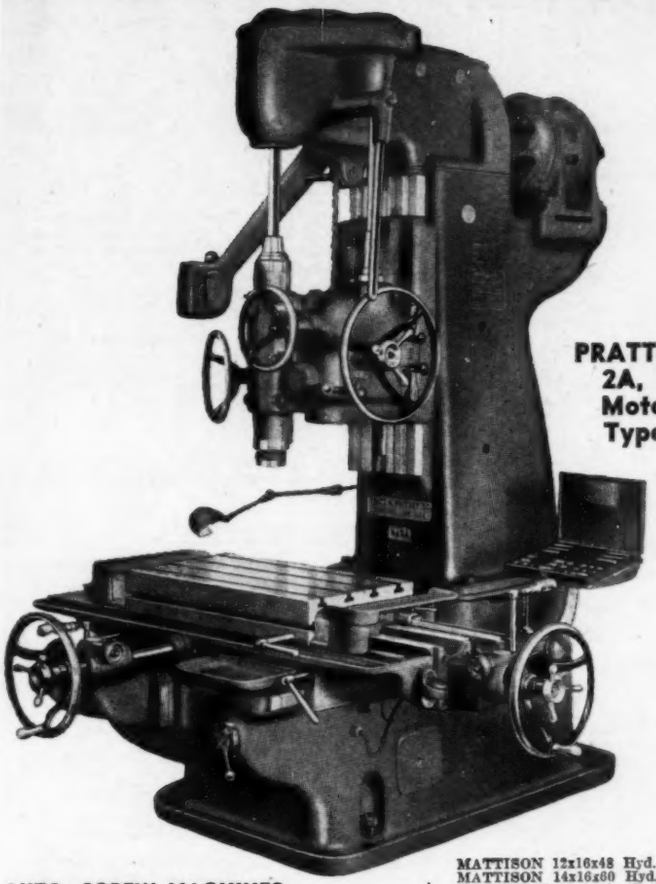
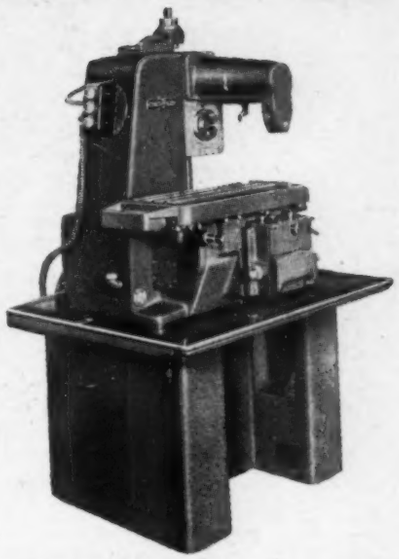
381 Atlantic Ave., Boston, Mass.

LATEST TYPE NEARLY NEW MACHINES



PRATT & WHITNEY 2A, 3B Jig Borer, Motor Drive, Latest Type



CINCINNATI 0-8 Plain Automatic Milling Machine, Timken, with Automatic rise and fall, Motor Drive, Latest Type

AUTO. SCREW MACHINES
ACME GRIDLEY 2" Model RA 6-spindle
BROWN & SHARPE #4 High Speed, 1½"
CONOMATICS 3½"—4 spindle—latest type
CONOMATIC 2⅝"—6 spindle—latest type

BORING MILLS—Horizontal
DETRICK & HARVEY 4", 5" bar, Floor Type
LANDIS #35, 3¼" bar, Floor Type
NILES BEMENT POND 4½" bar, Motor Drive
NILES BEMENT POND 5", 6", 7" bar, floor
UNIVERSAL #3A—3" Bar, Motor Drive

BORING MILLS—Vertical
BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BETTS (Consolidated) 100"—2 heads, DC, Latest
BULLARD 36" N E Type
KING 36" Vertical Turret, M.D., Latest Type
NILES 75", 100", 120", 2 swivel heads; PRT; MD

GEAR CUTTING EQUIPMENT
BARBER-COLMAN type "A" Hobber, latest
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #615A, 645A3, #7, 7A, 72, 75A, 77 High Speed Gear Shapers, latest type.
GOULD & EBERHARDT #36H, 96H, with diff., M.D.
HERCULES 24" Hobber, differential, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with defferential

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 3, 4, Uni. Latest
BROWN & SHARPE #5 Plain, 3x12, Latest
LANDIS 6x18 Type "C", Hyd., Latest Type
LANDIS 30x220" Centers, Plain, Motor Drive
NORTON 16x72 Plain Type "C", latest type
NORTON 16x72" Univ., Hyd., Type C, latest
NORTON 14x36" Univ., Hyd., Type C, latest

GRINDERS—Surface
ARTER 30" Rotary Surface—Hyd.—latest type
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #27-18 M.D., Latest Type
DOALL #G10, 8x24", Hyd., latest type
GALLMEYER & LIVINGSTON #35, 8x24" Hyd.
GALLMEYER & LIVINGSTON #55, 12x36" Hyd.
MATTISON 12x16x48 Hyd., Latest Type
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type
THOMPSON 8x12x24 Hyd., latest type

LATHES—Engine and Mfg.
BETTS BRIDGEFORD 60"x24' bed (raised to 84")
BRIDGEFORD 36"x28', 36"x32' bed—M.D.
LEBLOND 13"x4', 17"x5', 17"x14' bed, Rapid Production, Timken Bearing, latest type
LODGE & SHIPLEY 16/20"x30" centers, Timken Bearing, latest type
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers Timken Bearing, latest type
NILES—42x60", double head, motor drive
NILES 48x23', 32', 34', 35' Centers, Heavy Duty, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 60"x10', 15', 35', 40', Centers, Heavy Duty, 1 or 2 carriages, Latest Type
NILES 30x50' Boring, Timken, Latest Type
NILES 36x24' Centers, Time Saver, Timken Bearing, PRT, Latest Type
PITTSBURGH 50"x30' bed—M.D.
REED PRENTICE 24x20' bed, AC, M.D.
SPRINGFIELD 16x54" centers, Timken Bearing, latest
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

LATHES—Turret
CINCINNATI ACME, No. 1, No. 5W, Timken, latest
GISHOLT No. 3D Simplimatics—Timken
GISHOLT #2, 4, 5, Univ., Timken, Latest
GISHOLT No. 4L 9" hole—cross sliding turret—Timken Bearing—latest type
GISHOLT #1L, #2L, Universal Timken, Latest
JONES & LAMSON #3, 7C, 8A, 9A Univ., Timken
LIBBY No. 1H-5 Timken Bearing—latest—5⅛" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
WARNER & SWASEY #2, 3, 4, 5, Universal, Timken Bearing, Latest Type
WARNER & SWASEY #1A Univ., Timken, latest
WARNER & SWASEY #3A, 4A Univ., 6" hole, Bar or Chucking, Timken Bearing, latest type

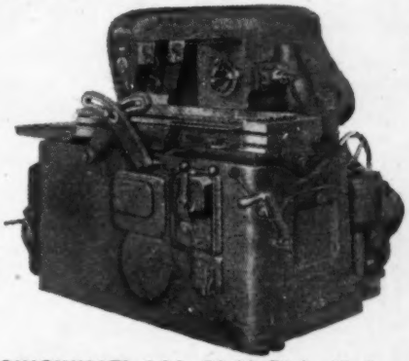
MILLING MACHINES—Mfg.
CINCINNATI 4-36 Hydromatic, Latest Type
INGERSOLL 32x24x16' Planer Type, 2 heads, AC
INGERSOLL 48x42x16' Planer Type, 4 heads, AC

MILLING MACHINES—Plain
CINCINNATI #4, 4S, 5, Timken Bearing, M.D.
CINCINNATI #2, #3, Dial Type, Timken, Latest
KEARNEY & TRECKER #2H, 3K, 4K, Timken
KEMPSMITH #4 Maximill, Timken Bearing, latest

MILLING MACHINES—Vertical
CINCINNATI #2, #4 Dial Type, Timken
CINCINNATI No. 3, No. 4 High-Powered, M.D.
KEARNEY & TRECKER 2K, 3K, Timken
REED PRENTICE #3VG, with or without Detroit Hyd. Univ. Duplicator, Timken Bearing, latest type

PLANERS
CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
NILES BEMENT POND 48x48x16', 2 heads, AC
OHIO 42x42x20'—2 heads, AC, M.D.

SHAPERS
CINCINNATI 26" Travel Head—2 head type B
GOULD & EBERHARDT 24" High Duty, M.D.
LAMAIRE 18' Vert. Hydraulic—latest type
MOREY 8", 10", 12", 14" Vertical, latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
PRATT & WHITNEY 6', 10" Vertical, M.D.
SMITH & MILLS 25" Heavy Duty, latest type



CINCINNATI 4-36, 56-90 Plain Hydromatic Milling Machine, Timken, Hydraulic, Latest Type

Available for Prompt Shipment ***Most Built After 1941***

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

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QUALITY *Machine Tools*

NOW IN STOCK

AUTOMATICS

2¾" RA-6 Acme-Gridley, New in 1943.
3½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
1⅝"—8 Spindle Conomatic, New in 1942.

BORING MILLS

No. 31 Lucas Horizontal, m.d.

BROACHES

CPC 24 LaPointe Hyd., Vertical. New '45.
HP 20 LaPointe Hyd., Hrzntl. New '43.

DRILLS

★ **28" Cincinnati-Bickford Super Service Drill, box column type, with flanged quill unit, motor driven. Latest model.**
4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42" Cincinnati-Bickford.
★ **No. 3B-12 Edlund, four spindle, back gear and semi-auto. power feed, m.d. New 1944.**
★ **No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.**
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS

No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 & 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.
★ **No. 3616 Cleveland Rigidhobber, spur or spiral gears to 42" diameter x 16" face, m.d. New in 1943.**

GRINDERS

No. 22 Heald Rotary Surface Grinder.
No. 18 Blanchard Surface Grinder. New in 1944.
No. 72A3 Heald Sizematic Intern. Grndr.
6 x18 Cincinnati Cylindrical. New in 1943.
10 x 36 Landis Plain Hyd. Cylindrical Grinder. New in 1943.
14" x 48" Cincinnati Plain Self contained Grinder, Filmatic-bearings.
No. 13 Brown & Sharpe Universal & Tool.
★ **No. 2 Cincinnati Centerless Grinders, with Filmatic spindle, some with through feed rest, others with in-feed; motor driven. New in 1940 and 1941.**
★ **Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.**
14" x 60" Mattison Surface Grinder, Hydraulic. Late model.

LATHES, ENGINE

12" x 30" Pratt & Whitney, g.h.
10" x 20" Monarch EE Toolmakers Lathe. Latest model.
14" x 6' Sebastian, motor in base.

18—28" x 20' Centers Bertram "Time-saver" (Niles Pattern) Engine Lathes: Sixteen speed helical cut (MAAG type) geared head, quick change, screw cutting, with rapid traverse to carriage, some with taper attachment, all with chuck, motor and control. Latest model.

16" x 216" Landis Plain Hydraulic Grinder, Type B, with swivel table, dead type headstock spindle, power feed. New in 1941. Short use period.

★ **22" x 72" Monarch CM Lathe, flame hardened ways, anti-friction taper attachment. New in 1944.**
24" x 12' Monarch helical, g.h.
48" x 12' Lodge & Shipley, c.d.
IMP and LR Lo-Swing Lathe, m.d.
15" x 30" Lipe Carbo-matic. New in 1943.
17" x 50" LeBlond Production, m.d. New in 1942.

LATHES, TURRET

★ **No. 3L Gisholt, g.h. Cross sliding turret, taper attachment. New in 1943.**
No. 4A Warner & Swasey, g.h. New '42.
No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h. New '43.
No. 4 Gisholt, Univrsl., g.h. New in 1943.
No. 3 Warner & Swasey, g.h. New 1943.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
42" Bullard VTL, New Era.

MILLS

No. 26 Van Norman, ram type, swivel head, new in 1943.
No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 5 Cincinnati Plain High Power Model HO.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 2 MH Cincinnati Plain, m.d.
★ **28" x 60" Cincinnati Vertical Hydrotel, single spindle, with profile tracing attachment, motor driven.**
No. 4 Cincinnati Vertical, high speed dial type, latest model.
No. 2 H Milwaukee Vert., motor in base.
No. 2 Cincinnati Vertical, motor in base, new in 1943.
No. 2209 Milwaukee Mill, table 22"x158".
No. 3-36"Cinci. Hydromatic Duplex, m.d.
Nichols Hand Mill, coolant equipment. New in 1943.

PLANERS AND SHAPERS

16" Gould & Eberhardt Crank Shaper.
20" American Crank Shaper, m.d.
★ **24" Ohio Extra Heavy Dreadnaught Shaper, universal table, rapid traverse, latest model.**
6" Pratt & Whitney Vertical Shaper.
No. 14 Cochrane & Bly Vertical Shaper.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. M.D.

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EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
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QUALITY TOOLS

AUTOMATIC

16"x33" Fay with air operated tailstock. New 1942.

ENGINE LATHE

20"x72" centers American Pacemaker. Taper attachment, collets, 2 chucks, pan & pump. Built 1946.

BORING MILL

4¾" bar, No. 300 Giddings & Lewis, floor type Vertical travel 62", horizontal travel 132", feed of bar 40" Has outer support and bed plate.

PLANER

96"x48"x12' Liberty with 2 rail and 1 side head. Has power rapid traverse, forced feed lubrication and variable voltage drive with MG set.

BROACH

No. HP50 Lapointe hydraulic with extension broach support. 25 ton capacity, 72" stroke. Built in 1940.

SENSITIVE DRILL

24" Allen 3 spindle No. 3 type VCPF with power feeds and back gears. New 1942.

TAPER SPLINE HOBBER

Type T Barber Colman wth long overarm with support at rear for long work. For splines or gears. New 1944.

CENTERLESS GRINDERS

Nos. 2 & 3 Cincinnati with Filmatic bearings, hydraulic profile truing. Built from 1940 to 1943.

CYLINDRICAL GRINDERS

6"x18" No. 10 Brown & Sharpe electric-hydraulic. Three have oscillating attachment.
New in 1941 and 1942.

SURFACE GRINDERS

6"x18" & 10"x24" Norton hydraulic. New 1942.

TURRET LATHES

Nos. 3, 4 & 1L Gisholt. Built from 1942 to 1944.

VERTICAL TURRET LATHE

36" Bullard, spiral geared, built 1942. Also 24", 36" & 42" New Era type.

PLAIN MILLERS

No. 3 High Speed & No. 4 Medium Speed Cincinnati dial type horizontal. New in 1942.

MANUFACTURING MILLERS

No. 2-24" Cincinnati automatic. Nos. 3-36, 4-36, 4-48, 5-48, 5-60 and 5-60 duplex Cincinnati Hydramatic. Built from 1942 through 19

VERTICAL MILLERS

Nos. 2M, 2, 3, 4 & 4 High Power Cincinnati Nos. 2H, 3H & 4H Kearney & Trecker. Built 1942 to 1944.

PRESS

1000 Ton No. 866 Toledo knuckle joint coining with 4½" stroke and Farval lubrication.

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICH.

STOCK TOOLS — *Prompt Shipment*

AUTOMATICS, 3½" Cone 4-Spindle (4)
AUTOMATIC, 1⅞" Cone 4-Spindle (2)
BOLT CUTTER, No. 22 Murchey, Dble. Hd.
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal.
BORING MILL, Hor. 3½" Landis Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 40" King, 2 heads, M.D.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface No. 5 Abrasive., 14"x48".
GRINDER, Surf. Hyd. G & L, 14"x18"x72"
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Board Drop, 1,000#, B. & S.
HOIST, Monorail, 3 ton, Detroit, D.C.
LATHE, 24"x16' B & E Grd. Hd.
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain No. 3 Milwaukee, S.P.D.
MILLER, Plain, Nos. 3B, 4 & 5 Cincinnati.
MULT-AU-MATICS, Bullard Type A, 6-Spdle
PUNCH & SHEAR, No. 2 Kling, ½"-½", 24" thr.
PUNCH & SHEAR, "C" L & A, 2½"-1½", 72" thr.
PLANER, Openside, 36"x36"x12' Cleveland
SHAPER, 32" Gould & Eberhardt, M.D.

PARTIAL LIST

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PRATT & WHITNEY
No. 2A JIG BORER
with ATTACHMENTS

AARON MACHINERY CO., INC.
45 CROSBY STREET NEW YORK, N. Y.

Bolt Cutter, 1"-1½"-2"-2½"-4" Acme, Landis.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 6' Cin.-Bick. 5' Carlton.
Lathe, Turret 3-A W. & S., S.P.D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

West Penn Machinery Company
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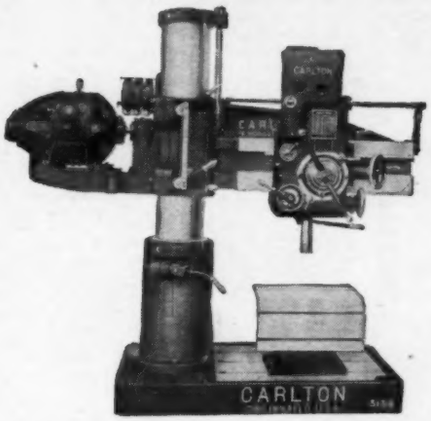
For RADIAL DRILLS . . see SIMMONS



(See above) 7' Arm, 14" column CARLTON Plain with 10 HP, 230 V, DC motor and Westinghouse control. 84 spindle speeds RPM 19 to 1040.

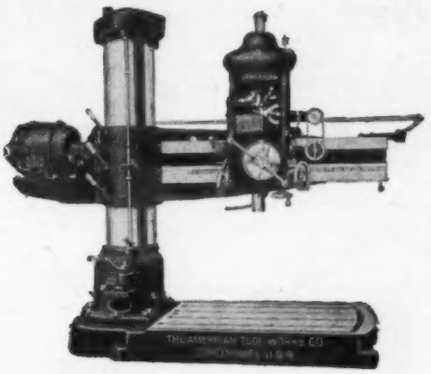
4' CARLTON, 13" column Plain High Speed (36 to 2000 RPM). Motor on Arm. 48 speeds, 18 feeds, 15 HP, 230 V, DC motor and Westinghouse control.

4' CARLTON, 13" column Plain Motor on Arm. 84 speeds, 14 to 800 RPM, 7½ HP, 230 V, DC motor and Westinghouse control.

7' Arm, 14" column AMERICAN Triple Purpose (5 ft. drill with arm and base extended at factory). 15 HP, 230 volt, DC motor on arm.

8' Arm, 16" column AMERICAN Triple Purpose Motor on Arm, 15 HP, 230 V, DC Pneumatic column binder.

(See below) 8' Arm, 19" column AMERICAN Triple Purpose electrically operated column clamp, separate motor for arm elevation, P.R.T.



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Drills, high speed single & multiple spindle
Drills, 21" Royersford Bk Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindles
Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
Gear Cutter, Brown & Sharpe #3—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer, 24"x24"x6' Pease motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

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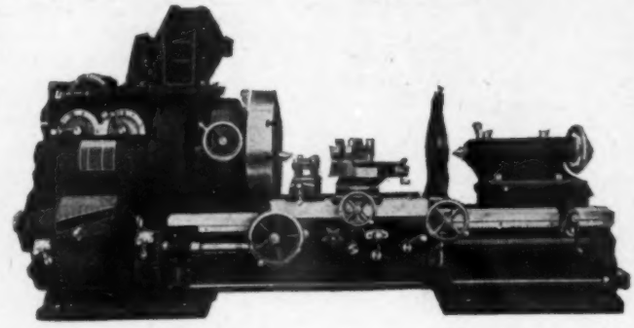
38" swing; 25' length of bed; With 2 carriages, tailstock, two tool posts, 2 steady rests and 2 thread chasing dials; Multiple vee belt motor drive with 20 HP General Electric AC motor.

36"x15½' BETWEEN CENTERS HOUSTON, STANWOOD AND GAMBLE 9 SPEED GEARED HEAD Q.C.G. ENGINE LATHE:
41" swing; 24' length of bed; With cross slide, heavy duty tool post, tailstock, 2 centers, thread chasing dial; Geared motor drive with 25 HP Westinghouse DC motor.

36" x 7' BETWEEN CENTERS HOUSTON, STANWOOD AND GAMBLE 9 SPEED GEARED HEAD Q.C.G. ENGINE LATHE:
41" swing; 15' length of bed; With cross slide, heavy duty toolpost, tailstock, 40" face plate, thread chasing dial; Geared motor drive with 20 HP Westinghouse DC motor.



36"x29' BETWEEN CENTERS LEBLOND Q.C.G. ENGINE LATHE:
39" swing; 36' length of bed; With compound cross slide; With toolpost, tailstock and centers; With steady rest; With 36" face plate, chuck and 4 chuck jaws; Belted motor drive thru gear box with 10 HP G.E. AC motor.

36" x 15' BETWEEN CENTERS SCHUMACHER & BOYE GEARED HEAD Q.C.G. ENGINE LATHE:
37" swing; 20' length of bed; With compound cross-slide, tool post, tailstock and two centers, steady rest, 36" internal geared face plate, four independent chuck jaws and three extra chuck jaws; Geared motor drive, less motor.

30"x11' BETWEEN CENTERS LODGE & SHIPLEY Q.C.G. ENGINE LATHE:
30½" swing; 16' length of bed; With compound cross-slide; tool post, tailstock, one center, steady rest, two 28" four jaw independent chucks, one 29" face plate, one 15" driving plate, taper attachment; Silent chain motor drive, less motor.

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24½" swing; 228" length of bed; With cross slide; toolpost, tailstock and 2 centers, 2 steady rests, micrometer carriage stop, 15" four jaw independent chuck; 20" face plate, 10" dog plate and coolant pump; Multiple vee belt motor drive with 10 HP General Electric AC motor.

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Flame hardened ways; will swing 20½"; length of bed 104"; with compound cross-slide, toolpost, tailstock and two centers; with thread chasing dial; with face plate, dog plate, chuck, coolant pump, and pan; motor driven with 7½ HP AC motor.

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#2-18 Cincinnati Automatic Millers

#3 Cincinnati Vertical Miller

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2½", 4" Binsee
Niles-Bement-Pond 4" duplex
Universal 3"
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B. & S. No. 2, 2B Surface, M.D.
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Norton 50"x28', M.D. Roll Grinder
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B. & S. No. 10 11 Cyl.; 1, 3 Univ.
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Monarch, Hendey 12x30, 16x42 G.H., Late
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14"x6' Hendey, Taper, Collets
9" LeBlond, P&W Auto.
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4', 5' 6' American Triple Purpose

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No. 1 Cleveland Vert., M.D.
#12, #22L Van Norman Univ.
#2B K & T Univ.; No. 2A B & S Univ.
#2HL Milwaukee, M.D. late
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3, Vert.
B & S #12 Elec. Prod. late type

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Cincinnati 20" shaper, like new.
Oliver No. 510 Drill Pointer
Buffalo #0 Angle Roll, M.D.
#20 Bliss OBI, #53-OB Power Presses
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6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6"
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Univ. 3A Hor. Bor. Mill, with 3" bar.

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1—14' Sellers, 2 heds. on cross rail, elect. equip.

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1—Cin. 30"x30"x12', 2 heds. on cross rail, "Herringbone gear", rev. motor drive, rap. trav.
1—Amer. Fndry. & Mach. Co. 30"x30"x10', 1 hed. on cross rail, 1 side hed., Openside Planer, M.D.
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1—Cin. No. 2 Pl. Horiz. Miller, M.D., tbl. wkg. surf. 43¾"x10", all power feeds: long. 28", cross 8", vert. 19".

UNIVERSAL MILLERS
1—Van Norman No. 2 Duplex Miller, tbl. wkg. surf. 41⅞"x9¾", power long. feed 28", cross 11", vert. 18".
1—Van Norman No. 3 Duplex Miller, high speed mill. attmt., 12 speeds, tbl. wkg. surf. 48¼"x10", power feed: long. 32", cross 12", vert. 18⅞".
1—B. & S. #2A Univ. Millslr, dbl. overarm, motor in base, tbl. wkg. surf. 45"x11⅛", power feed: long. 28", cross 10", vert. 18".
1—Cin. #2 Hi-Power Univ. Miller, M.D., tbl. wkg. surf. 46"x12", power feed: long. 25", cross 8", vert. 18".

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1—Brand new—Gemco 20" Univ. Shaper, power down feed.
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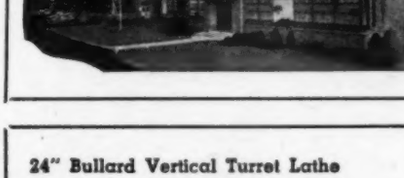

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Grinder, #13 B.&S., 3/60/220-440 V.
Grinder, #2 Cin. Tool & Cutter, 3/60.
Grinder, #91-C. Coval Tool & Cutter, 3/60.
Grinder, 10x24" Landis Univ. Hyd., 3/60.
Grinder, Thread, Exacto 39L, M.D.
Grinder, #1 B.&S. Universal, 3/60/220.
Lathe, 606 Rivett, BB; BG; QCG; TA; M.D.
Miller, #4 Burke, Vert. Hd., Index, M.D.
Shaper, 14" G. & E. Universal Tool, M.D.

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2—ARTER Model A-3 Rotary Surface Grinders, all Motor Driven.

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Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes Monarch Model "C"
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Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills.
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Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
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#360-F GIDDINGS & LEWIS, Floor Type, M.D.
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#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P & W Hyd. Gear Grinder, M.D.
#5 B & S Plain Grinder, M.D.
10"x72" HILL-CLARKE (Norton) Grinder, M.D.
#11 BLANCHARD Rotary, 16"x20" chucks.

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12"x30" MONARCH Model "C" Lathe, M.D.
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#2G KEMPSMITH All Geared Univ., M.D.
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#3MS CINCINNATI Dial Type, Vert., M.D.
#3HS CINCINNATI Dial Type, Vert., M.D.
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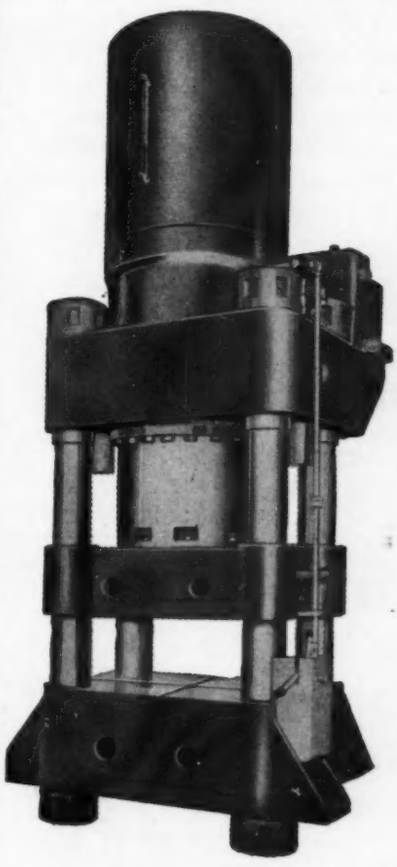

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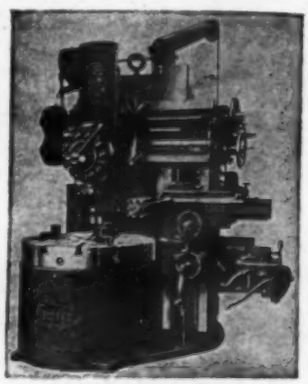

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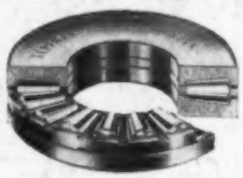
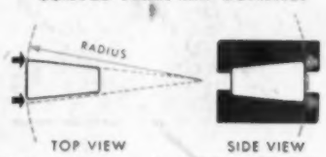
REMEMBER, Timken alone makes its own steel and is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. The Timken Roller Bearing Company, Canton 6, Ohio.

GENERATED UNIT ASSEMBLY

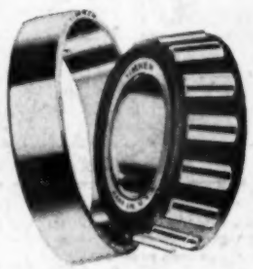


Extra manufacturing process makes Timken heavy duty thrust bearing a "Generated Unit Assembly".

CURVED AREA RIB CONTACT



Curved area of roll end (at arrows) fits perfectly the curve of upper and lower ribs of this thrust bearing.



TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST → LOADS OR ANY COMBINATION ↘